THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS’ ITEMS RESPONSE ANALYSIS REPORT FOR THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2018

O71 CIVIL ENGINEERING
STUDENTS’ ITEMS RESPONSE ANALYSIS REPORT FOR THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2018

071 CIVIL ENGINEERING
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FOREWORD

The Students’ Items Response Analysis (SIRA) report on the Form Two National Assessment (FTNA) 2018 for the Civil Engineering Subject has been produced in order to provide feedback to secondary school students, teachers, education specialists, policy makers, and other stakeholders. The examiners analysed the students’ responses for each question and identified some factors which contributed to poor performance like students’ inability to interpret the demand of the question, incorrect mention of sequence of operations in various practical procedures and lack of knowledge and skills in various topics. Each question is well analysed and the performance is illustrated using sample answers extracted from the students’ scripts.

The Form Two National Assessment is a comprehensive evaluation, which among other things, appraises the effectiveness of the general education system and specifically the mode of education delivery in Tanzania’s Secondary Schools. The National Examinations Council of Tanzania presumes that the feedback that is provided in this report will enable various actors in the public or private sectors, individuals and others who work within the education sector, to take appropriate measures in enhancing general students’ performance. The report has been concluded with recommendations to the on-going secondary school students, teachers and the Ministry of Education, Science and Technology.

The National Examinations Council of Tanzania remains grateful to all the Examinations Officers and other people who participated in processing and analysing the data used in this report in various capacities.

Dr. Charles E. Msomde

EXECUTIVE SECRETARY
1.0 INTRODUCTION

This report provides detailed analysis of the performance of the students in Civil Engineering paper in Form Two National Assessment (FTNA) in 2018. The paper adequately covered the Syllabus for Secondary School Education issued in 1994 and the paper was set in accordance with the Examination Format of 2016.

The Civil Engineering Assessment paper had thirteen (13) questions divided in two sections A and B. Section A comprised 8 questions; each weighing 5 marks, to make a total of 40 marks. Section B comprised 5 questions whereby each carried 60 marks. The students were instructed to answer all questions in section A and one question from section B depending on their areas of specialization.

Question 1 was a multiple choice one which comprised five items (i) to (v), drawn from various topics. Question 2 was a matching item question and consisted of five items (i) to (v) drawn from the topic on walls (arches). Question 3 consisted of five TRUE or FALSE assertions which required the students to write the word TRUE for the correct assertions and FALSE for the incorrect ones. The question was drawn from the topic on Walls. Questions (4) to (8) were short answer items derived from various topics including Foundation, Materials, Walls and Scaffolding.

Section B comprised 5 questions based on students’ specializations. Question 9 was drawn from of Surveying. The parts of the question were derived from the following topics; Introduction, Surveying Instruments, Chain surveying and Chain and Compass Traversing. Question 10 was based on Carpentry and Joinery. Specifically, the question was set from Tools, equipment and Machines, Timber and Joints.

Question 11 was based on the brickwork and masonry field. The topics included brick and block making, mortar, bonding and concrete. Question 12 was based on the field of Painting and Signwriting. It covered the sub-topics of Tools, equipment and plants, brushes, Paint and Painting material, Painting technique, Water paint and Texture finishes. Lastly, Question 13 was based on the field of Plumbing. The question specifically covered the topics that included safety, tools, equipment’s and plants, materials, bending and threading and pipe fitting.
A total of 655 students sat for this examination, out of 677 registered students. In 2017, the number of students who sat for FTNA for this subject was 549 which indicates there was an increase of 16.18% of students in 2018.

Generally, the performance was poor as only 29.77% of the students who sat for this assessment passed and 70.23% failed. The distribution of scores and students performance is shown in Table 1 and Figure 1.

**Table 1: General Students’ Performance in Civil Engineering Subject**

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 29</td>
<td>Weak</td>
<td>Number 460 Percentage 70.23</td>
</tr>
<tr>
<td>30 - 64</td>
<td>Average</td>
<td>Number 192 Percentage 29.32</td>
</tr>
<tr>
<td>65 – 100</td>
<td>Good</td>
<td>Number 03 Percentage 0.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong> 655 Percentage 100</td>
</tr>
</tbody>
</table>

![Figure 1: General Students’ Performance in Civil Engineering](image)

Relevant explanations on students’ failures to attain the expected performance are given in each question. Sample answers extracted from the students’ scripts have been attached to illustrate various aspects of students responses in the topics tested.

This report aims at providing feedback to the teachers, education stakeholders on the performance of the students for each question. The report presents the analysis of the students’ performance by indicating the
task they were required to carry out in each question and how they responded.

2.0 ANALYSIS OF STUDENTS’ ITEMS RESPONSE IN EACH QUESTION

2.1 SECTION A: VARIOUS TOPICS

2.1.1 Question 1: Multiple Choice Items

This question consisted of (5) five items (i) - (v) based on various topics within the syllabus. Each item carried 1 mark. Students in this question were required to demonstrate their skills in selecting the suitable type of foundation for a boundary and retaining wall, mentioning the correct member fixed diagonally across the standards for added rigidity of scaffolding erection, identify the correct process of terminating the walls at ends construction, selecting appropriate factors which affect the durability of timber and lastly to select the uses of information obtained during soil investigations.

A total of 655 candidates attempted this question and their general performance was good as 7.6% scored 0 out of the 5 marks allotted. Moreover, 5.5% of the students who attempted this question scored all the 5 marks and 86.9% got scores ranging from 1 to 4 marks.

The summary of students’ scores for this question is presented in Table 2 and Figure 2.

Table 2: Trend of student’s performance in question 1

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>-</td>
<td>Omitted</td>
<td>-</td>
</tr>
<tr>
<td>0 – 1</td>
<td>Weak</td>
<td>165</td>
</tr>
<tr>
<td>2 - 3</td>
<td>Average</td>
<td>334</td>
</tr>
<tr>
<td>4– 5</td>
<td>Good</td>
<td>156</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>655</td>
</tr>
</tbody>
</table>
The students who managed to score good marks were able to answer correctly most of the questions by choosing the correct answers from the given alternatives of the multiple choice. This shows that they had good knowledge on foundations and walls, temporary structures such as scaffolding, construction materials specifically timber and soil investigations. On the other hand, students who scored poorly had inadequate knowledge on some of the topics tested since they failed to choose the correct answer from among the given alternatives.

The majority of students responded poorly to the items (i), (ii) and (iii).

In item (i), the students were required to select the suitable type of foundation for boundary and retaining walls. The question read:

(i)  *The foundation which is suitable for boundary walls and retaining walls is known as:*


The correct response was B ‘Strip foundation.’ The students who chose the correct answer ‘Strip foundation’ had enough knowledge on the selection of suitable type of foundation for boundary and retaining walls. The students who chose A ‘Pad foundation’ failed to understand that such a type of foundation is suitable for supporting a column load.
Those who selected C, ‘Raft foundation’ lacked enough knowledge on foundation selection, since such foundations are suitable for weak soils where the superstructure load is distributed evenly over the soil. The students who chose D, ‘Pile foundation’ did not understand that the type of foundation is suitable in waterlogged areas. Lastly, students who chose E, ‘Deep foundation’ did not understand that such type of foundation is usually suitable where hard bearing stratum is found.

In item (ii), the students were instructed to choose the appropriate member of scaffolding fixed diagonally across the standard. The question read as follows

(ii) A ledger fixed diagonally across the standard for added rigidity of scaffolding is known as

A reveal pin.  B standard.  C joint pin.  
D brace.  E put log.

The correct answer was D ‘brace’. The students who managed to get the correct answer had enough knowledge on scaffold erection since the members in scaffolding which are tied at an inclined angle/diagonally are braces. The students who chose A ‘reveal pin’ failed to understand that this is a component used to tie the tube member of scaffolding. Those who selected B, ‘standard’ did not understand that ‘standard’ is an upright member of the scaffold where brace is to be fixed. Thus it does not make sense when used in the sentence. The students who chose C, ‘joint pin’ did not understand that ‘joint pin’ is a component which is used to fix the tube member of scaffolding at the joint. Lastly, students who chose E, ‘put log’ did not understand that ‘put log’ is a member which is fixed at the right angle to the standards and it is supported by the wall.

In item (iii), the question tested student’s knowledge on setting successive brick/block work courses at the end of the wall in a stepped form. The question read:

(iii) The process of setting back each successive courses by 5cm of a wall is called
The correct answer was C ‘raking back’. The students who chose A ‘toothing’ failed to meet the demand of the question due to their lack of knowledge, since ‘toothing’ is the process of indenting bricks alternately projecting at the end of a wall. The students who chose B, ‘kick back’ failed to realize that ‘kick back’ is a tendency of a piece of timber to be propelled back towards the operator at high rate of speed when he/she is trying to touch the circular saw. Those who selected D, ‘cracks back’ did not understand that ‘cracks back’ is a plausible distractor and those who chose E, ‘plastering back’ did not realize that ‘plastering back’ does not have any connection with the arrangement of brick/blocks in successive courses. Skilled students could easily eliminate the three distractors B, D and E because such distractors did not reflect the pattern of the question.

### 2.1.2 Question 2: Matching Items:

This question was derived from a topic on walls in building construction. The students were required to match the descriptions of arch terms mentioned in list A with specific names in list B by writing the letter of the correct response from list B beside a number from list A.

#### Question 2: Matching items Questions

<table>
<thead>
<tr>
<th>List A</th>
<th>List B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) The underside surface of an arch</td>
<td>A Abutment</td>
</tr>
<tr>
<td>(ii) The portion of the wall which supports the arch</td>
<td>B Soffit</td>
</tr>
<tr>
<td>(iii) The highest point of an arch</td>
<td>C Spring point</td>
</tr>
<tr>
<td>(iv) The lower part of an arch which is half way to the crown</td>
<td>D Crown</td>
</tr>
<tr>
<td>(v) An imaginary line joining the two points in an arch</td>
<td>E Haunch</td>
</tr>
<tr>
<td></td>
<td>F Spring line</td>
</tr>
<tr>
<td></td>
<td>G Span line</td>
</tr>
</tbody>
</table>

The question was attempted by 655 students out of whom 21.8% scored 0. On the other hand 72.7% got scores that ranged from 1 to 4 marks and 5.5% scored all the 5 allotted marks. The general performance for
this question was good. The trend of student’s performance in this question is summarized in Table 3.

Table 3: Trend of student’s performance in question 2

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>Students</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Omitted</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>0 – 1</td>
<td>Weak</td>
<td>301</td>
<td>49.95</td>
<td></td>
</tr>
<tr>
<td>2 - 3</td>
<td>Average</td>
<td>227</td>
<td>42.30</td>
<td></td>
</tr>
<tr>
<td>4 – 5</td>
<td>Good</td>
<td>77</td>
<td>11.75</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>655</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Trend of Student’s Performance in Question 2

Majority of the students provided poor responses for items (i), (ii) and (v). Presented below is the analysis of students' responses for these items.

In item (i), the students were required to match the term which conforms with the underside surface of an arch. The correct response was B ‘Soffit’. The students who chose the correct response ‘Soffit’ had good knowledge of the arch terminology. The students who chose D ‘Crown’ failed to understand that the term ‘crown’ refers to the highest point of an arch.
In item (ii), the students were required to match the term that defines the portion of the wall which supports the arch. The correct answer was A ‘Abutment.’ The students who chose response A ‘Abutment’ had good knowledge about arches. The students who matched it with E ‘Haunch’ failed to understand that a haunch is the lower part of an arch which is half way to the crown.

In item (v), the students were required to match the expression with the term that defines an imaginary line joining two points in an arch. The correct response was F ‘Springing line.’ The students who chose response F ‘springing line’ had good knowledge about arches. The students who matched with E ‘Span line’ failed to understand that this was a plausible distractor.

### 2.1.3 Question 3: True and False

This question required the students to write TRUE for the correct assertions and FALSE for the incorrect ones on the five statements set from the topic on walls. The question was attempted by 654 students which was equivalent to 99.75% of all the students who sat for this assessment out of whom 2% scored 0 and 1.4% scored all the 5 marks and 96.6% of the remaining ones got scores ranging from 1 to 4 out of 5 marks allotted.

Generally, the question was performed well as 84.30% of the students scored above average marks. Table 4 represents the performance of the students in this question.

#### Table 4: the trend of students’ performance in Question 3

<table>
<thead>
<tr>
<th>Score</th>
<th>Remarks</th>
<th>Students</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Omitted</td>
<td>Number</td>
<td>1</td>
</tr>
<tr>
<td>0-1</td>
<td>Weak</td>
<td>103</td>
<td>15.71</td>
</tr>
<tr>
<td>2-3</td>
<td>Average</td>
<td>404</td>
<td>61.7</td>
</tr>
<tr>
<td>4-5</td>
<td>Good</td>
<td>147</td>
<td>22.44</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>655</td>
<td>100</td>
</tr>
</tbody>
</table>

The question required the student to recall some important facts on the skills acquired on the construction of wall. Majority of the students remembered those facts but a few students were not able to recall
correctly the facts contained in all the statements. Item (ii) was the mostly poorly performed by majority of the students. The item asked;

(ii) The opening in a wall must have a lintel to support the construction above it.

Although most of the students agreed that, this statement is true, the fact is different. For example, the students failed to recall the function of an arch and a beam in the building construction. Moreover, they failed to realize that, together with its ornamental functions, an arch in wall construction supports the progressive activity above the wall. In summary, an opening in a wall requires more than a lintel. Extract 3.1 and 3.2 illustrate the poor and good responses respectively.

**Extract 3.1**

<table>
<thead>
<tr>
<th>3. For each of the following statements, write True if the statement is correct or False if the statement is not correct.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Walls can only be classified as load bearing and non-load bearing.</td>
</tr>
<tr>
<td>(ii) The opening in wall must have a lintel to support the construction above it.</td>
</tr>
<tr>
<td>(iii) Brickwork above and below ground level must be separated by a damp-proof course (DPC).</td>
</tr>
<tr>
<td>(iv) A lintel can only be made from concrete or timber.</td>
</tr>
<tr>
<td>(v) Partition walls are used for the same reason as party walls.</td>
</tr>
</tbody>
</table>

Extract 3.1 A sample of response of a student who failed to answer any of the statement correctly and scored zero mark.

**Extract 3.2**

<table>
<thead>
<tr>
<th>3. For each of the following statements, write True if the statement is correct or False if the statement is not correct.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Walls can only be classified as load bearing and non-load bearing.</td>
</tr>
<tr>
<td>(ii) The opening in wall must have a lintel to support the construction above it.</td>
</tr>
<tr>
<td>(iii) Brickwork above and below ground level must be separated by a damp-proof course (DPC).</td>
</tr>
<tr>
<td>(iv) A lintel can only be made from concrete or timber.</td>
</tr>
<tr>
<td>(v) Partition walls are used for the same reason as party walls.</td>
</tr>
</tbody>
</table>

Extract 3.2 A sample of the response provided by a student who was able to recall the facts of those statements and scored all the marks.

**2.1.4 Question 4: Foundation**

This question was based on the topic on foundation. Students were required to define (a) settlement and (b) to outline three causes of
settlement. The question was attempted by 653 students which was equivalent to 99.7% of all the students who sat for this assessment. Out of whom 575 scored 0, twenty seven (27) scored all the 5 marks and 53 got scores that ranged from 1-4.5 marks. The majority of these students performed poorly in this question as summarized in Table 5 and Figure 4.

**Table 5: The trend of students’ performance in Question 4**

<table>
<thead>
<tr>
<th>Score</th>
<th>Remark</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Percentage (%)</td>
</tr>
<tr>
<td>-</td>
<td>Omitted</td>
<td>2</td>
</tr>
<tr>
<td>0-1</td>
<td>Weak</td>
<td>589</td>
</tr>
<tr>
<td>2-3</td>
<td>Average</td>
<td>37</td>
</tr>
<tr>
<td>3.5-5</td>
<td>Good</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>655</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

**Figure 4: General Student’s performance in question 4**

Most of the students were not able to define the term ‘settlement.’ Also, they failed to outline causes of settlement. These failures indicate that they did not have enough knowledge on foundations. This analysis shows that some of the students gave explanations related to foundation but did not answer the questions asked. Instead, they tried to explain the purposes/functions of the foundations as illustrated in extract 4.1.

**Extract 4.1**
Further analysis of the students’ responses shows that majority of the students related the term ‘settlement’ of foundation to normal shelter based on traditional list of immediate “basic needs” as illustrated by Maslow’s hierarchy of needs under physiological needs. The students explained the need for people to have a place where they live as illustrated in extract 4.2.

**Extract 4.2**

4. (a) What do you understand by the term settlement?

(b) Outline three causes of settlement.

(i) 
(ii) 
(iii) 

Extract 4.2 A sample of a poor response by the student who scored zero after writing Maslow’s hierarchy of needs in physiological needs.

However, there were a few students who gave correct responses by defining the term ‘settlement’ as well as outlining the causes of settlement. Extract 4.3 provides a sample of a script of a student who was able to define ‘settlement’ and outline causes of settlement.

**Extract 4.3**
Extract 4.3 A sample of good response by a student who defined settlement and outlined its causes.

2.1.5 Question 5: Construction Material

The question required the students to name five factors on which transportation of fresh concrete depends.

The question was attempted by 652 students, of whom 82.7% scored 0. On the other hand, 16.5% got scores ranging from 1 to 4 marks and 0.3% scored all the 5 given marks. The general performance in this question was poor as indicated in Table 6 and Figure 5.

Table: 6 The trend of student performance in question 5

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>-</td>
<td>Omitted</td>
<td>3</td>
</tr>
<tr>
<td>0 – 1</td>
<td>Weak</td>
<td>584</td>
</tr>
<tr>
<td>2 - 3</td>
<td>Average</td>
<td>58</td>
</tr>
<tr>
<td>4 – 5</td>
<td>Good</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>655</td>
</tr>
</tbody>
</table>
There was poor performance in this question since 82.7% of the students scored 0. Most of the students failed to name five factors required to transport fresh concrete. Some of them named types of materials used to prepare concrete instead of factors which were required in the questions. Others named types of foundation where concrete is used as base concrete.

There are a number of factors which are assumed to have contributed to the mass failure for this question. These factors include lack of practical skills, poor understanding of the subject matter and wrong interpretation of the question. Extract 5.1 provides a sample script for a poor response presented by the student who wrote construction materials instead of factors required to transport fresh concrete.

**Extract 5.1**

<table>
<thead>
<tr>
<th>5.</th>
<th>Name five factors that transportation of fresh concrete depends.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td></td>
</tr>
<tr>
<td>(iv)</td>
<td></td>
</tr>
<tr>
<td>(v)</td>
<td>Bricks or bricks</td>
</tr>
</tbody>
</table>

Extract 5.1 A sample response presented by the student who wrote construction materials instead of factors required to transport fresh concrete.

**Figure 5: Trend of Student’s Performance in Question 5**
Despite these poor responses, there were a few students who managed to mention the factors required to transport the fresh concrete. Extract 5.2 illustrates a sample of such responses.

**Extract 5.2**

![Image](image.png)

Extract 5.2 A sample script of the best response presented by the student.

### 2.1.6 Question 6: Walls

This question had two parts (a) and (b). Students were required in part (a) to define ‘composite walling’ and in part (b) to name three factors to be considered and kept in mind when building the corner of the wall.

The question was attempted by 653 students, out of whom 87.5% scored 0. 12.1% had scores that ranged from 1 to 4 marks and 0.1% scored all the 5 allotted marks. The general performance for this question was poor as indicated in Table 7 and Figure 6.

**Table 7: Trend of student performance in question 6**

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>-</td>
<td>Omitted</td>
<td>2</td>
</tr>
<tr>
<td>0–1</td>
<td>Weak</td>
<td>621</td>
</tr>
<tr>
<td>2–3</td>
<td>Average</td>
<td>29</td>
</tr>
<tr>
<td>4–5</td>
<td>Good</td>
<td>05</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>655</strong></td>
</tr>
</tbody>
</table>
Most of the students in part (a) failed to define ‘composite wall.’ The students were supposed to show that “composite walling is a system of walling whereby the total thickness of the wall is made by using a combination of two different materials: For example, the inner side is built by stones and the outer side is built by facing bricks.” Some of the students seemed to have not understood the question as they defined this wall as foundation and others defined it as a building material. In part (b), some of the students failed to understand the demand of the question. Hence, instead of naming factors to be considered and kept in mind when building the corner of the wall, they mentioned tools and materials used in construction works.

The performance for this question was poor because only 0.2% of the students could provide correct responses for this question. These candidates had basic knowledge on building materials and wall construction. Extracts 6.1 and 6.2 provide sample scripts of poor and good responses respectively.
**Extract 6.1**

| 6 (a) Define composite walling. |
|------------------------------|---|
| It is a structural component of architectural design in the building. |

| 6 (b) Name three factors to be considered and kept in mind when building the corners of the wall. |
| --- | --- |
| (i) Accuracy |
| (ii) Speed |
| (iii) Teamwork |

Extract 6.1 The response of the student who failed to write relevant materials in all parts of the question.

**Extract 6.2**

| 6. (a) Define composite walling. |
|------------------------------|---|
| It is a wall which is made from two or more materials together. Example a wall is made by brick on the inner face and at outer face it is made of stones. |

| 6. (b) Name three factors to be considered and kept in mind when building the corners of the wall. |
| --- | --- |
| (i) A corner should not have a vertical continuous joint |
| (ii) A corner should be built at right angle (90) |
| (iii) It should use quality materials. Example brick and also should be straight from the base to the roof |

Extract 6.2 A sample of good response from a student who was able to provide relevant materials in all parts.

**2.1.7 Question 7: Arches**

This question comprised parts (a) and (b). The students were required in part (a) to define ‘Arches’ and in part (b) to mention three geometrical forms of arches.

The question was attempted by 653 students, of whom 82.3% scored 0. Additionally, 16% got scores that ranged from 0.5 to 4.5 marks and 1.4% scored all the 5 marks. The general performance in this question was poor as indicated in Table 8 and Figure 7.
Table 8 - The trend of student performance in question 7

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Omitted</td>
<td>Number 2 Percentage (%): 0.30</td>
</tr>
<tr>
<td>0.5 – 1</td>
<td>Weak</td>
<td>569 86.57</td>
</tr>
<tr>
<td>2 - 3</td>
<td>Average</td>
<td>52  7.93</td>
</tr>
<tr>
<td>4.5 – 5</td>
<td>Good</td>
<td>34  5.19</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>655 100</td>
</tr>
</tbody>
</table>

Figure 7: General Students Performance in Question 7

Most of the students in part (a) failed to define ‘arches’. The students were supposed to say that, arches are an arrangement of wedge-shape blocks mutually supporting each other over an opening and designed to carry the wall and the load above. Some of the students seemed to have not mastered the knowledge of arches as they defined ‘arches’ as a person who does the work of building project and others defined it as an angle, a temporary structure which supports the portion of the wall, a kind of drawing that is used to draw building plans. In part (b) some of the students failed to mention the three geometrical forms of arches. Instead, they mentioned parts of arches, materials forming arches and others gave education and professional qualification of architects, since they failed to differentiate between arches and architects.
The analysis shows that the students' performance for this question was poor because only 4% of the students scored good marks. Extract 7.1 illustrates a sampled script of a poor response provided by the student.

**Extracts 7.1**

<table>
<thead>
<tr>
<th>Extract 7.1</th>
<th>A sample of a poor response for this question.</th>
</tr>
</thead>
</table>

However, there are few students who had enough knowledge on arches and were able to explain clearly the meaning of arches and mentioned the three geometrical forms of arches as illustrated by extract 7.2.

**Extracts 7.2**

<table>
<thead>
<tr>
<th>Extract 7.2</th>
<th>A sample script of a good response given by the student.</th>
</tr>
</thead>
</table>

2.1.8 **Question 8: Scaffolding**

This question was set from the topic on scaffolding. The students were required to differentiate between single coupler and double coupler scaffolding.
This question was attempted by 655 students. Out of them, 92.7% scored 0. 3.8% got scores ranging 0.5 to 4.5 marks and 2.9% scored all the 5 allocated marks and 0.6% did not attempt this question. The general performance in this question was poor. Table 9 and Figure 9 illustrate the students' scores.

Table 9: The trend of student performance in question 8

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 – 1</td>
<td>Weak</td>
<td>613</td>
</tr>
<tr>
<td>1.5 - 3</td>
<td>Average</td>
<td>13</td>
</tr>
<tr>
<td>4 – 5</td>
<td>Good</td>
<td>29</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>655</td>
</tr>
</tbody>
</table>

Figure 8: General Students Performance in Question 8

The analysis shows that the students' performance for this question was poor because only 4.5% scored good marks. This was indicative that these students had the basic knowledge of scaffolding. On the other hand, poor performance of students in this question could be attributed to lack of knowledge in steel scaffolding because of that, they wrote irrelevant information. Extract 8.1, illustrates a sampled script of a student whose responses involved irrelevant information related to single coupler and double coupler scaffolding.
Extracts 8.1

A sample of the students’ responses for a student who wrote irrelevant information in this question.

Despite the aforementioned weakness, a few students managed to score high marks in this area of specialization. They successfully differentiated single coupler and double coupler scaffolding. They also showed adequate knowledge on types of scaffolding. Extract 8.2 illustrates the sampled script of a response of a student who was able to give the difference between single coupler and double coupler scaffolding.

Extracts 8.2

A sample of a response for the student who was able to differentiate single coupler from double coupler scaffolding.
2.2 SECTION B: AREA OF SPECIALIZATION

2.2.1 Question 9: Surveying

This question was attempted by students specializing in surveying. The topics covered in this question included introduction, surveying instruments, chain surveying, chain and compass traversing. The question was divided into five parts, (a), (b), (c), (d) and (e), which required the students to show their ability to use basic surveying tools, instruments and demonstrate their knowledge on the application on surveying principles. The question read as follows:

9  (a)  (i)  What are the two basic principles of surveying?
     (ii)  Mention two classification of surveying based on the following:
           •  Accuracy desired  •  Instrument used
           •  Purpose of survey  •  Place of survey.

(b)  Explain the four requirements of good field notes.

(c)  Describe the use of the following tools: (i) plumb bob (ii) line ranger (iii) pages (iv) ranging poles (v) arrows and (vi) plasterers laths.

(d)  (i)  Calculate the number of links 20cm in the length for a 30m metric chain
     (ii)  Differentiate between back sights from foresight
     (iii)  Define closed transverse and open transverse.

(e)  (i)  Give four reasons for natural errors.
     (ii)  Outline the four principal methods of traversing
     (iii)  What are the two principal methods of plotting a traverse survey?

This question was attempted by 28 students who specialized in this area. Out of them 5 students (17.86%) scored 0. On the other hand, 17 students (60.71%) who attempted this question got scores that ranged from 1 to 17.5 marks while the remaining 6 students (21.43%) got scores ranging from 18 to 38.5 marks. No one scored above average marks. The overall performance, therefore, was poor. Table 10 and Figure 9 illustrate the students' scores.
Table: 10- The trend of student’s performance in question 9

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 17.5</td>
<td>Weak</td>
<td>22</td>
</tr>
<tr>
<td>18 – 38.5</td>
<td>Average</td>
<td>06</td>
</tr>
<tr>
<td>39 – 60</td>
<td>Good</td>
<td>00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>655</strong></td>
</tr>
</tbody>
</table>

Figure 9: General student's performance in question 9

The analysis of the students' performance indicates poor performance in this question as only 21.43% of the students who attempted this question provided correct responses in parts a (i), and (ii), b, c and e. This means that such students had good knowledge on the basic principles of surveying. Extract 9.1 provides a sample of a good response from the students' answer sheet.
9. (a) (i) What are the two basic principles of surveying?
   - To work from the whole to the part
   - To locate a new station by at least two measurement (linear and angular) from fixed reference point

(ii) Mention two classification of survey based on the following:
   - Accuracy desired
     - Plane survey
     - Geodetic survey
   - Instrument used
     - Chain survey
     - Compass survey
   - Purpose of survey
     - Mining survey
     - Archaeological survey
   - Place of survey
     - Aerial survey
     - Land survey
(b) Explain four requirements of good field notes.

(i) Legible should be clear and can be read easily.

(ii) Good field notes should include short and important information.

(iii) Good field notes should be written briefly and understandable.

(iv) Good field notes should be written in a good arrangement of process and by good handwriting.

(c) Describe the use of the following tools:

(i) Plumb bob

A tool which is fixed on the ground shows boundary of an area which should not be used for some time while doing survey activities in that area.

(ii) Line ranger

Used to measure direct measurement by establishing intermediate point in a straight line between two end points.

(iii) Pages

An instrument plotted on the ground in which chain or other measuring instruments pass through them to measure distance or sometimes are plotted to mark point of measurement.

(iv) Ranging poles

A sharpened pole of ranging rod that help ranging rod to fixed on the ground.
Extract 9.1 A sample of a student’s script with a good response on some areas of the question.

However, 78.57% of the students failed to provide correct answers in some parts of the question. Instead, they provided irrelevant answers which could not conform to the demand of the question. Others misinterpreted the requirement of the question and hence they did not
score good marks. Their poor response indicated that they lacked knowledge on the basic surveying tools, instruments and surveying principles. Extract 9.2 provides the sample of a script for the student who produced a poor response for the whole question.

**Extract 9.2**

9. (a) (i) What are the two basic principles of surveying?
   - To locate a new station.
   - To locate a new station at least by measurement

(ii) Mention two classification of survey based on the following:
   - Accuracy desired
     - Precision of time
     - Precision of distance
   - Instrument used
     - Ranging rods
     - Theodolite
   - Purpose of survey
     - Traversing, purpose of survey
     - Aerial placing, triangulation, purpose of survey
   - Place of survey
     - Hydrology, hydrology of water
     - Aerial plan, aerial placing
(b) Explain four requirements of good field notes.

(i) Logible

(ii) Comprehensive

(iii) Concise

(iv) Presented in good plan lettering and etc.

(c) Describe the use of the following tools:

(i) Plumb bob
   Used for to support all bad liquid and stay at the damp

(ii) Line ranger
   Is a range that used at to rang the lane in straight

(iii) Poles
   Is used to take the report and to move for safe at either pole or book

(iv) Ranging poles
   Is the ranging used at shows either the straight line and to locate a station
2.2.2 Question 10: Carpentry and Joinery

This question was attempted by 86 students who specialized in Carpentry and Joinery. The topics covered in this question included tools, equipment and machines, timber and joints. The question was divided into five parts (a), (b), (c), (d) and (e), which required the students to demonstrate their knowledge in using relevant tools, equipment and plants/machinery to produce different components of wood structure. The question read as follows:

10 (a) Briefly describe the following various types of joints which are used in wood work.
   (i) Lengthening joint
   (ii) Widening joints
   (iii) Framing joints
   (iv) Angle or corner joints

(b) Define the following terms as used in carpentry and joinery.
   (i) Sawing  (ii) Planning  (iii) Rebating
   (iv) Nosing  (v) Batten  (vi) Housing
(c) (i) What is timber?
   (ii) Mention five uses of timber
   (iii) What are the factors which determine the quality of timber?

(d) (i) Classify a timber as used in engineering works.
   (ii) Define the term ‘conversion’ as used in the timber.
   (iii) Categorize the methods of timber conversion.
   (iv) What are the defects of timber?
   (v) Enumerate two common categories of timber defects

(e) (i) Demonstrate three uses of jig saw or scroll saw.
   (ii) Identify the common works performed by the following processes;
       - Three main processes involved in the manufacture of joinery work
       - Four common saw milling processes.

The question was attempted by 84 (100%) students who specialized in this area. A total of 7 (8.3%) students scored 0. Moreover, 69.10% of the students scored below average while the remaining 22.60% of the students scored average marks. There was no student who scored above average. That shows that the general performance for this question was poor. Table 11 and Figure 10 illustrate the students’ performance in this question.

Table 11: The trend of students’ performance in question 10

<table>
<thead>
<tr>
<th>Score</th>
<th>Remark</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>0-17.5</td>
<td>Weak</td>
<td>65</td>
</tr>
<tr>
<td>18-38.5</td>
<td>Average</td>
<td>19</td>
</tr>
<tr>
<td>39-60</td>
<td>Good</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>84</td>
</tr>
</tbody>
</table>

Figure 11: General students’ performance in question 10

Poor performance in this question indicates that majority of the students lacked knowledge in their field of specialization especially in the questions that needed them to demonstrate practical skills. Students
who scored poorly failed all parts of the question. It seems more emphasis should be given a practical part so as to enable the students to acquire the practical skills needed if that is done, those students will be able to understand the subject matter and answer the questions properly. However, some of the students who attempted this question wrote relevant responses in some parts but failed in other parts.

Extract 10.1 provides a sample of responses given by a student who failed this question completely and extract 10.2 presents a sample response for a student who produced relevant answers for some parts of this question.

**Extract 10.1**

<table>
<thead>
<tr>
<th>(a)</th>
<th>Briefly describe the following various types of joints which are used in wood work.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Lengthening joints</td>
</tr>
<tr>
<td></td>
<td>- Lead bearing</td>
</tr>
<tr>
<td></td>
<td>- Non-lead bearing</td>
</tr>
<tr>
<td></td>
<td>- Treatment bearing</td>
</tr>
<tr>
<td>(ii)</td>
<td>Widening joints</td>
</tr>
<tr>
<td></td>
<td>- Natural widening joints</td>
</tr>
<tr>
<td></td>
<td>- Artificial widening joints</td>
</tr>
<tr>
<td>(iii)</td>
<td>Framing joints</td>
</tr>
<tr>
<td></td>
<td>- Attreatment for framing</td>
</tr>
<tr>
<td></td>
<td>- Wood framing</td>
</tr>
<tr>
<td></td>
<td>- Timber framing</td>
</tr>
</tbody>
</table>

---

30
(iv) Angle or corner joints
- First. Plan corner joints.
- Second. Plan corner joints.
- Third. Plan corner joints.

(b) Define the following terms as used in carpentry and joinery.
(i) Sawing
Sawing is the type of timbering to produce the timber conversion.

(ii) Planning
Planning is the type of timber to help know the carpentry and joinery.

(iii) Rebating

(iv) Nosing
Is the type of timber connected or the timber.

(v) Batten
Is the wood where by using the timber, paper back, black, and pith.

(vi) Housing
Are made up of the timber in which the decoration.

(c) (i) What is a timber?
Timber is a wood that collection treatment of the bark, black, paper, sleeping.

(ii) Mention five uses of timber:
- Back
- Black
- Roof
- Annual
- Pith

(iii) What are the factors which determine the quality of timber:
Factors which determine the quality of the timber are the timber are produce a timber ward to connected the collection decoration on the housing.

(d) (i) Classify a timber as used in engineering works.
Timber as used in engineering works is used to take a ball bearing and non lead bearing in the building.
(ii) Define the term ‘conversion’ as used in the timber.

Conversion as used in timber is the wood that has been treated to suit the requirements of manufacture and joinery work.

(iii) Categories the methods used for timber conversion.

(iv) What are the defects of timber?

- Soft wood timber
- Hard wood timber

(v) Enumerate two common categories of timber defects.

(e) (i) Demonstrate three uses of Jig saw or scroll saw.

- Help to produce the timber
- Help to shape or cut the wood
- Help to convert the wood

(ii) Identify the common works performed by the following processes:

- Three main processes involved in the manufacture of joinery work:
  - Manufacturing body
  - Manufacturing wood timber

Extract 10.1 sample of script of a student who produced a poor response in some areas of the question.

Extract 10.2

10. (a) Briefly describe the following various types of joints which are used in woodwork.

(i) Lengthening joints

Is the clarification of joint used to increase the length of timber using the special method like end butt joint, spliced joint, half-lapped joint, and laminated joint.
Extract 10.1 sample of script of a student who produced a good response on some areas of the question.

2.2.3 Question 11: Brickwork and Masonry

This question was set based on the brickwork and masonry subject. Specifically, the question came from the brick and block making, mortar, bonding and concrete topics. The question was divided into five parts (a), (b), (c), (d) and (e), which required students to

(ii) Widening joints

Is the classification of joint in which the timber are joined to increase the width of timber by using either rebate joint, edge butt joint, tongue and groove joint and loose tongue joint.

(iii) Framing joints

Is the class of joint in which two or more timber are joined in order to make junction of timber to change the direction or angle. Example: bridle, joint.

(iv) Angle or corner joints

Is the class of joint in which two or more timber are joined to make junction or angle in order to change the direction of timber.

(b) Define the following terms as used in carpentry and joinery.

(i) Sawing

Is the process of cutting timber by using the saw.

(ii) Planning

Is the process of smoothing the timber by using plane.

(iii) Rebating

Is the process of parting the timber using chisel or gauges in order to make the trench.
demonstrate their knowledge on the basic principles and skills of building a house. The question read as follows:

11. (a) Explain the four types of mortar which are used in brick masonry.

(b) Differentiate between the following:

<table>
<thead>
<tr>
<th></th>
<th>Stretcher</th>
<th>Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Stretcher</td>
<td>Header</td>
</tr>
<tr>
<td>(ii)</td>
<td>King closer</td>
<td>Queen closer</td>
</tr>
<tr>
<td>(iii)</td>
<td>Stretcher course</td>
<td>Header course</td>
</tr>
<tr>
<td>(iv)</td>
<td>Stretcher bond</td>
<td>Header bond</td>
</tr>
<tr>
<td>(v)</td>
<td>Face</td>
<td>Facing</td>
</tr>
<tr>
<td>(vi)</td>
<td>Racking back</td>
<td>Tooting</td>
</tr>
</tbody>
</table>

(c) (i) Mention two common types of concrete.
(ii) Explain the two common methods of mixing concrete.

(d) (i) Mention three constituents of a good bricks earth with its percentages.
(ii) Why brick masonry sometimes preferred over other types of masonry? Give four reasons.

(e) (i) Explain the following phases as applied in the concrete technology.
- First phase (initial set)
- Second phase (final set)
- Third phase

(ii) Briefly explain the four common ingredient of cement concrete.

This question was attempted by 419 students who specialized in this area. Out of those, 111 students (26.5%) scored 0. Moreover, 131 students (31.3%) got scores that ranged from 1 to 17.5 marks, 134 students (32 %) had scores that ranged from 18 to 38.5 marks and 43 students (10.2 %) got scores that ranged from 39 to 60 marks. The overall performance was, therefore, moderate. Table 12 and Figure 11 analyse the performance of the students for this question.
Table 12: The trend of student’s performance in question 11

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>0 – 17.5</td>
<td>Weak</td>
<td>242</td>
</tr>
<tr>
<td>18 – 38.5</td>
<td>Average</td>
<td>134</td>
</tr>
<tr>
<td>39 – 60</td>
<td>Good</td>
<td>43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>419</td>
</tr>
</tbody>
</table>

Figure 10: General student's performance in question 11

The analysis of the students' performance in this area of specialization shows that the question was moderately performed since 42.2 percent of the students were able to explain the four types of mortar, differentiate various brickwork terminologies, to mention two common types of concrete and to explain the two common methods of mixing concrete. This means that such students had good knowledge on the basic principles and skills of building a house. Extract 11.1 provides a sample of the best response from one of the students’ scripts.
11. (a) Explain the four types of mortar which are used in brick masonry.

- **Lime mortar:** It is type of mortar, formed when mixing time, and water, and addition of small amount of cement to facilitate mixing. It is also known as bonding material.

- **Cement mortar:** It is type of mortar, formed when mixing sand, cement, and addition of small amount of water to facilitate mixture. It is known as binding medium.

- **Coarse mortar:** It is type of mortar, formed when mixing stone and sand with addition of water to facilitate the mixture. It is known as 1:2 in 1:1/8.

- **Clay mortar:** It is a kind of mortar used for bonding, stones, as well as plastering, but usually mixed by mixing clay and addition of water.

(b) Differentiate between the following:

<table>
<thead>
<tr>
<th></th>
<th>Stretcher</th>
<th>Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Stretcher course</td>
<td>In the course, with all brick laid in stretcher face...</td>
<td>In the course, with all brick laid with header since...</td>
</tr>
<tr>
<td></td>
<td>In the course with all brick laid in stretcher face...</td>
<td>In the course with all brick laid with header since...</td>
</tr>
<tr>
<td></td>
<td>In the course, with all brick laid in stretcher face...</td>
<td>In the course, with all brick laid with header since...</td>
</tr>
<tr>
<td></td>
<td>In the course, with all brick laid in stretcher face...</td>
<td>In the course, with all brick laid with header since...</td>
</tr>
<tr>
<td>(ii) King-closer</td>
<td>...the type of close in which two equal parts of a...</td>
<td>...the type of close in which two equal parts of a...</td>
</tr>
<tr>
<td></td>
<td>...the type of close in which two equal parts of a...</td>
<td>...the type of close in which two equal parts of a...</td>
</tr>
<tr>
<td></td>
<td>In the course, with all brick laid in stretcher face...</td>
<td>In the course, with all brick laid with header since...</td>
</tr>
<tr>
<td></td>
<td>In the course, with all brick laid in stretcher face...</td>
<td>In the course, with all brick laid with header since...</td>
</tr>
<tr>
<td>(iii) Stretcher bond</td>
<td>In the course with all brick laid in stretcher face...</td>
<td>In the course with all brick laid with header since...</td>
</tr>
<tr>
<td></td>
<td>In the course with all brick laid in stretcher face...</td>
<td>In the course with all brick laid with header since...</td>
</tr>
<tr>
<td>(iv) Face</td>
<td>In the course with all brick laid in stretcher face...</td>
<td>In the course with all brick laid with header since...</td>
</tr>
<tr>
<td></td>
<td>In the course with all brick laid in stretcher face...</td>
<td>In the course with all brick laid with header since...</td>
</tr>
<tr>
<td>(v) Facing</td>
<td>In the course with all brick laid in stretcher face...</td>
<td>In the course with all brick laid with header since...</td>
</tr>
</tbody>
</table>
(c) (i) Mention two common types of concrete:
- Reinforced concrete – 1:2:4
- Mason concrete – 1:3:6

(ii) Explain the two common methods of mixing concrete:
- By hand: This is usually done by hand by following the following procedure:
  - Measure sand and cement.
  - Then mix the mixture well.
  - Add water to the mixture of sand and cement and mixing them by few batches.
  - Final put water to the mixture, sand, gravel and cement to facilitate it.
- By Machine: It is commonly used in large sites. Instrument or gun machine, used is called concrete mixer. Some used in large sites are called continuous mixer work continuously. While others are used in small sites called Batch mixer. In small sites, gravel, sand, and water, cement, and additive are put in a drum, and then pour sand, with additiveness, before to fill into the mixture.

(d) (i) Mention three constituents of a good bricks earth with its percentages.
- Refractory clay: It is a constituent of brick which makes it resistant to high temperature.
- Silica Sand: It is also used when mixing with cement to make it adhere to it.
Extract 11:1 A sample of a script of a student who produced good responses for the larger part of the question.

On the other hand, 57.8% of the students failed because they provided irrelevant answers, omitted or misinterpreted some questions. In part (a), for example, some students failed because they did not have the
skills and knowledge that could enable them to answer the question properly. A good example is that of a student who was required to explain the types of mortar used in brick masonry. Instead of doing that, the student wrongly mentioned timber mortar, concrete mortar and basement mortar as the types of mortar. The term “Timber mortar” was not correct because mortar is used to bind masonry units and wood glues are suitable for binding timber products. In addition, the term “concrete mortar” was not correct, since concrete is a mixture of cement, fine aggregate and coarse aggregate and water is added to facilitate the mixing. The presence of coarse aggregate renders it inappropriate to act as mortar. Also the term “basement mortar” was not correct because basement is part of a building below the ground level. This shows that the student did not understand the question. In part (b), some of the students failed because they seemed to have not understood the demands of the question. Students were required to differentiate brickwork terms. Instead, they wrongly explained the uses of brickwork tools. Their poor responses indicate that they lacked knowledge on the basic principles and skills of building a house. Extract 11.2 shows a sample of a poor response from one of the students’ scripts.

**Extract 11.2**

11. (a) Explain the four types of mortar which are used in brick masonry.

- Is a term book a fles with here this of a area hostions working.

- Is it harsick watching all working eye from brick and all are thing for working.

- Is the work off at that plan does a staying a case for or to used of washing are keep work has.

- To that a plan for work hatar's form.
(b) Differentiate between the following:

<table>
<thead>
<tr>
<th>(i) Stretcher</th>
<th>Header</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the work for form ehe that following ko with are</td>
<td></td>
</tr>
<tr>
<td>bonds head, bonding over, lining, turning, mortar, sealing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(ii) King-closer</th>
<th>Queen-closer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is closer one or parts not, lining</td>
<td></td>
</tr>
<tr>
<td>Is that lining, unit and split, mortar, bleeding</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(iii) Stretcher course</th>
<th>Header course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the header, stack, one sharing of brick</td>
<td></td>
</tr>
<tr>
<td>header three, head, one embed, hydrated, area, work, lining</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(iv) Stretcher bond</th>
<th>Header bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>This bond, factory, help sand, formation, curing, mortar, sealing</td>
<td></td>
</tr>
<tr>
<td>heads, head, bonding back, painful, room</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(v) Face</th>
<th>Facing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is facing, one help, bricks, lining</td>
<td></td>
</tr>
<tr>
<td>focusing, zone, help, outlet</td>
<td></td>
</tr>
</tbody>
</table>
(vi) Racking back  |  Toothing
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is one thing that a work</td>
<td>toddlers your a work tool</td>
</tr>
</tbody>
</table>

(c) (i) Mention two common types of concrete:
- The is a cement
- Ash are work

(ii) Explain the two common methods of mixing concrete.
- Is the tool that of work says are following to ordering some not brick area
- In the help work reflect on any one high level work facts useful举起 with reflect element school every to your tool

(d) (i) Mention three constituents of a good bricks earth with its percentages.
- sandy are good
- ment males to brick good
(ii) Why brick masonry sometimes preferred over other types of masonry? Give four reasons.

- Is that arrick of water free for example?
- Materials and labor factors being are
- As usual, following are brick
- It's a plan, basically brick jelled

(e) (i) Explain the following phases as applied in the concrete technology.

- First phase (initial set)
  For the initial stages, the concrete is spread evenly to form

- Second phase (final set)
  Second stages, final, lasting eventually hardens completely

- Third phase
  If the following of hydration stages are
  Solid columns study, back sanding. Study

(ii) Briefly explain the four common ingredient of cement concrete.

- Sand, water, plaster, wall, help all are half...by historical.
- Total rounds, halls, walls, plants of larger
- Is it, giving for following, brick, laying, ever, look steel
- That hidden, glass, likely, curves, Portugal, blend, weak, for...
2.2.4 Question 12: Painting and Signwriting

The question was set from the area of painting and sign writing and the topics it covered included *paint and painting materials, painting techniques and texture finishers*. It comprised parts, (a), (b), (c), (d) and (e). The question read as follows:

10 (a) (i) All paint materials are subjected to vigorous testing before used. Suggest six paint testing to be performed by manufacturers to ensure the quality of paints.

(ii) Explain the following general constituents that the paint is made up:
- A base
- A vehicle
- A drier

(b) Describe the following terms as used in panting works.

(i) Priming
(ii) Stopping
(iii) Under coatings
(iv) Finishing coat

(c) (i) What is ‘paint strip’?
(ii) Explain the procedures followed when painting the new iron and steel work

(d) (i) Enumerate four characteristic of a good varnish.
(ii) Why is thinner is added in a paint?
(iii) List two types of materials used as thinners.

(e) (i) Describe the following :
- Masking tape
- Tenting
(ii) Mention five areas which will need to be protected when working in domestic properties.
(iii) Name four areas which will need to be protected when working in commercial properties.

The total marks allocated for this question were 60. The question was attempted by 8 students. Three (3) students (37.5%) scored 0. Meanwhile, two (2) students (25%) got scores that ranged from 1 to 17.5 marks. Moreover 2 students (25 %) got scores which ranged from 18 to 38.5 marks and one student (12.5%) got scores ranging from 39 to
60 marks. The general performance of this question was poor as stipulated in Table 13 and Figure 12.

Table 13: The trend of student’s performance in question 12

<table>
<thead>
<tr>
<th>Scores</th>
<th>Remarks</th>
<th>General Students Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>0 – 17.5</td>
<td>Weak</td>
<td>5</td>
</tr>
<tr>
<td>18 – 38.5</td>
<td>Average</td>
<td>02</td>
</tr>
<tr>
<td>39 – 60</td>
<td>Good</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>08</strong></td>
<td></td>
</tr>
</tbody>
</table>

![Bar chart showing distribution of student performance](image)

**Figure 11: General student's performance in question 12**

The students' performance for this question was poor as only 37.5% of the students provided correct answers. This shows that these students had basic knowledge on painting and decorations. Extract 12.1 shows a sample of a good response to this question.
12. (a) (i) All paint materials are subjected to vigorous testing before use. Suggest six paint testing to be performed by manufacturers to ensure the quality of paints.

- It should be tested its opacity and hiding power
- It should be tested its spreading capacity
- It should be tested its consistency
- It should be tested its drying spread and drying time
- It should be tested its durability and length of paint to bond with surface

(ii) Explain the following general constituents that the paint is made up:

- A base
  - Is a solid material which forms a body of the paint material.

- A vehicle
  - Is a substance (always liquid) added to paint so as to enable to spread easily in surface (increase spreading capacity).

- A drier
  - Is a solid or liquid material added to paint so as to hasten drying of paint material on surface.

(b) Describe the following terms as used in painting works.

(i) Priming
- Is a process of applying coat on an object firstly, such as painting or varnishing.

(ii) Stopping
- Is a process of removing hard puffy old paint film, glue and dirt and other deposit on surface to be painted suit by use of stopping knife.

(iii) Undercoatings
- This are coats applied under (below) surface of a given material mainly for protection either of rust, decay or water soaping.
(iv) Finishing coat

is a final coat (film) to be applied on surface always is hard, with protective work and decoration.

(c) (i) What is ‘paint strip’?

This is a tool used to remove old paper from the wall, paint film and loosely attached deposit on surface before painting.

(ii) Explain the procedures followed when painting the new iron and steel work.

(i) First of all ensure surface is clean and free from foreign material and dirties also wall sanded and filled.

(ii) Take brush (flat wall brush) or curved roller and paint material applied. Brush or curved roller in paint container and apply on surface of iron.

(iii) Continue painting until it is wall spread and cover all surface of iron.

(iv) Allow the surface to dry well.

(v) After drying also paint another coat. Paint on surface is allowed to dry well. Your iron will be ready for use.

(d) (i) Enumerate four characteristics of good varnish.

- Should dry hard and with high gloss.
- A good varnish should improve with age.
Extract 12.1 sample of a script of the student who produced a good response in some areas of the question.

However, 62.5% of students showed that they had not adequately acquired basic knowledge on painting and decorations. Most of them omitted some parts of this question. The few who attempted this question produced irrelevant responses. For example, in part (e) (i) the question wanted the students to describe the term ‘masking tape.’ For
this, students were supposed to respond by saying that ‘masking tape is a cloth or paper tape backed with adhesive. It is stuck over any part of work to protect it from being painted.’ Instead, they described masking tape as a tool for measuring the length of work. These students failed to differentiate masking tape from a measuring tape. Hence, they did not understand the demand of the question. Extract 12.2 provides a sample of a response of this category.

Extract 12.2

(e) (i) Describe the following:

- Masking tape

Mm the tape that is used for taking measurements when painting.

- Tenting

Removng st the paper wall before painting is on.

(ii) Mention five areas which will need to be protected when working in domestic properties.

- While working in high buildings
- In electrical fields or electrical equipment
- Working in machines
- When painting iron metal or Kraft

(iii) Name four areas which will need to be protected when working in commercial properties.

- When working in ships
- When working in long buildings

Extract 12.2 A sample of a script of the student who produced a poor response in some areas of the question.
2.2.5 Question 13: Plumbing

This question was attempted by students who opted plumbing as their area of specialization. The question was composed from the topics which included introduction and workshop arrangement, safety and regulations, materials, bending and pipes works. The question was divided into five parts (a), (b), (c), (d) and (e). The question read as follows:

13. (a) (i) Explain the meaning of the following safety terms:
   - House keeping
   - Risk assessment.
   (ii) Briefly the action to be taken for an unsafe area when attending a victim of accident.
   (iii) Safety terms and precaution measures to be taken to avoid hazard.
   - Tripping
   - Burns

(b) (i) What are plumbing services?
   (ii) Briefly explain five duties of a plumber.

(c) (i) What is the main advantage and disadvantage of lead piping?
   (ii) What are the advantages of polythene piping over the metal piping?

(d) (i) Mention bending machines which are supplied in various forms suitable for all types of metal pipes ferrous or non-ferrous metal, thin and thick walled.
   (ii) State the components of a domestic service connection.
   (iii) Differentiate plumbing water supply and plumbing drainage system.

(e) (i) What is volume?
   (ii) Calculate the quantity of water in contained in which has a diameter of 38mm and a length of 7.5m.
The question was attempted by 113 students. Out of them, 37.2% scored 0. On other hand, 8.80% scored average marks and 0.9% scored above average and one student scored all the 60 marks allotted. The general performance for this question was poor. The trend of student’s performance in this question is as summarized in Table 14 and Figure 13.

Table 14 the trend of students’ performance in question 13

<table>
<thead>
<tr>
<th>Score</th>
<th>Remark</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>0-17.5</td>
<td>Weak</td>
<td>102</td>
</tr>
<tr>
<td>18-38.5</td>
<td>Average</td>
<td>10</td>
</tr>
<tr>
<td>39-60</td>
<td>Good</td>
<td>01</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>113</td>
</tr>
</tbody>
</table>

Figure 12: General Students Performance in Question 13

The analysis of the students' performance in this question shows that the performance was poor because only 9.7% of the students could provide the correct response for this question. However, there were students who scored average and above average marks. These students had good knowledge on plumbing as their area of specialization.

Students who performed well were able to provide relevant answers in some parts of this question few students omitted some parts of the question but majority of them failed because they did not produce
relevant responses. The students failed to recall the knowledge obtained in plumbing skills, although they wrote a lot of things to answer the question. Those explanations were unacceptable according to the demand of the question. Moreover, the students failed to make simple calculations which required them to calculate the volume occupied by 38mm diameter of a pipe with 7.5m height. Extract 13.1 shows the sample of a script of a student who wrote some explanations which were not acceptable according to the demand of the question.

**Extract 13.1**

13. (a) (i) Explain the meaning of the following safety terms:

- **House keeping.**

  House Keeping: This is the effort which are applied in order to keep house clean and order to prevent our selves from hazards even disease, like cholera.

- **Risk assessment.**

  Risk assessment: This is the assessment where by people have to care themselves and escaping them selves in a good condition or clean.

(ii) Briefly explain the action to be taken for an unsafe area when attending a victim of accident.

The action to be taken for an unsafe area when attending a victim of accident is to provide first aid on him/her. Example when a person bitten by a snake, you can hold tight a substance on his leg to prevent poison to flow on to the body.

(iii) Explain the measures to be taken to avoid the following hazards:

- **Tripping.**

  Tripping can be avoided by use of raised equipment.
(b) (i) What are plumbing services?

Plumbing services are services by which plumber provide to people of different places.

(ii) Briefly explain five duties of a plumber.

- Water supply: Plumbers are the ones who supply water to people of different communities.
- Construction of pipes: Plumbers are the ones who construct pipes of different types that can be used to supply water.
- Social service provision: In social service provision, plumbers ensure that people who paid the bill have to get services like water.
- Construction of WC (water closet) in toilets: In construction of water closet, plumbers use various types of material to construct this.
- Collection of taxes of bills: Plumbers collect taxes of bills of water from people that can help them to pay loans for government revenue.

(c) (i) What is the main advantage and disadvantage of lead piping?

Lead piping has got some advantage and disadvantages. Lead piping supply water to various places for a long period of time. Lead piping gets rust.
(ii) What are the advantages of polythene piping over the metal piping?

Polythene piping has got advantage over the metal piping because polythene pipes are pipes which are in plastic form so can supply water to various places while water are clean but metal piping can supply water for a long period of time as with rust and rust is dangerous to the human health.

(d) (i) Mention the bending machines which are supplied in various forms suitable for bending all types of metal pipes ferrous and non-ferrous, thin and thick walled.

- Pipe bender machine
- Bending machine former

(ii) State the components of a domestic service connection.

The components of a domestic service connection are in toilet, in kitchen, in bathroom, water in otherwise use e.g. domestic

(iii) Differentiate between plumbing water supply and plumbing drainage system.

The different between plumbing water supply and plumbing drainage system is plumbing water supply these are duty of plumber to supply water to different places while plumbing drainage system these are system constructed by plumber in toilets.
(e) (i) What is volume? \[ \text{volume of mass per unit area of the kg/m}^2 \]

(ii) Calculate the quantity of water in liters contained in a pipe which has a diameter of 38 mm and a length of 7.5 m.

\[
\begin{align*}
38 \text{ mm} &= \frac{38}{7.5} \\
&= 5.1333 \\
\times 3.8 \\
&= 60.0 \\
\frac{225}{2850} \\
&= 2850 \text{ mm}
\end{align*}
\]

Extract 13.1 A sample of the script of a student who produced a poor response on all parts of the question.

Despite the poor performance for this question, only one student obtained good marks in this question. This student scored good marks because he/she was able to give correct answer in many parts of the question. Also, he/she followed the instruction of the question on calculating the required quantity of water in litres contained in a pipe and correctly converted the cubic meters obtained into litres as instructed in the question. Extract 13.2 shows the script of the student who scored high marks.
13. (a) (i) Explain the meaning of the following safety terms:

- **House keeping.**
  
  Are the principles that need to keep yourself away from danger or accident. There is just one proper arrangement of things, in the workshop, or wherever.

- **Risk assessment.**

  Are the things that provide a great danger of facing an accident. Example, when welding, without protective shield.

(ii) Briefly explain the action to be taken for an unsafe area when attending a victim of accident.

  Provide help to the victim and remove him/her into safe place.

  Wearing of necessary equipment to protect him/her from other dangers.

(iii) Explain the measures to be taken to avoid the following hazards:

- **Tripping.**

  Avoid improper arrangement of tools or equipment in working area. Also, the floor should not be slippery and must be tough and clean.
(b) (i) What are plumbing services?

The duties that a person with plumbing skills should provide to the other people. Plumbing services are the services that focus mainly with pipe work, sanitation, drainage, water or gas supply.

(ii) Briefly explain five duties of a plumber.

- Installation of pipes for cold and hot water supply and gas supply in the building.
- Provision of essential information about quality water supply.
- Management of water from the building.
- Fixing of waste and soil equipment on the building.
- Provision of control of heating vessels on the building.

In order to increase heat (thermal) insulation in the building.

(c) (i) What is the main advantage and disadvantage of lead piping?

Advantage of lead pipes is that it can be used in gas supply, while its disadvantage is that it dissolve in water to form plumbeous which is in redish colour and can be harmful to the human body.
(ii) What are the advantages of polythene piping over the metal piping?

Polythene pipe is longer than metal pipe, where by it is 15 cm long.

Polythene pipe can be easily wound by spring method. It is less costly compared to metal pipe. Polythene pipe can not get rust while metal pipe does not.

(d) (i) Mention the bending machines which are supplied in various forms suitable for bending all types of metal pipes ferrous and non-ferrous, thin and thick walled.

It make heating of pipe to reduce the hardness and they does not require heating where by a machine is used to bend the pipe.

(ii) State the components of a domestic service connection.

Plain socket or convoluted tee pipe.
Reducing bush — reduce the diameter of pipe.
Elbow — change direction of pipe.
Polythene, galvanized mild steel pipe — it usually whereby water is flown.
Cross tee and tee — for supply of water in different direction.

(iii) Differentiate between plumbing water supply and plumbing drainage system.

Plumbing water supply deals with clean and safe water from the source like river, spring or well whereas the water can be used in the different activities. While storage system is the removal of waste and soil water from different source or waste water like in toilets, bathrooms and washing baths in order to be treated for future use or to maintain proper health hygiene.
(c) (i) What is volume?

Volume is the quantity a substance or object occupies and determined in \( \text{cm}^3 \) or \( \text{m}^3 \).

(ii) Calculate the quantity of water in liters contained in a pipe which has a diameter of 38mm and a length of 7.5m.

\[
\text{Volume} = \pi r^2 l
\]

\[
\pi \approx \frac{22}{7}, \quad r = 19 \text{ mm}, \quad l = 7.5 \text{ m}
\]

\[
\text{Volume} = \frac{22 \times 19^2 \times 7500}{7} = 850155 \text{ mm}^3 = 0.850155 \text{ m}^3
\]

\[
\text{Volume in liters} = \frac{0.850155 \text{ m}^3}{1000} = 0.850155 \text{ liters}
\]

Extract 13:2 A sample of a response by a student who produced relevant response in most parts of this question.
3.0 ANALYSIS OF THE STUDENTS’ PERFORMANCE IN DIFFERENT TOPICS

The topics covered in the Civil Engineering paper for FTNA 2018 included: *Construction materials, Site preparation, Foundation, Scaffolding and Shoring and Walls* in the compulsory section of the paper as well as optional parts of the assessment. In the surveying field, the topics tested included *Introduction to Surveying laboratory, Surveying Instruments, Chain surveying and Chain and Compass Traversing*. For Carpentry and Joinery, the topics tested included *Tools, equipment and Machines, Timber and Joints*. For the Brickwork and Masonry field, the topics tested included *Bricks and blocks making, Mortar, Bonding and Concrete*. As for the Painting and Signwriting field, the topics tested included *Tools, equipment, plants and brushes, Paint and Painting material, Painting technique, Water paint and Texture finishes*. Lastly, in field of Plumbing the topics included, *Safety, Tools, Equipment’s and plants, Materials, Bending and Threading and pipe fitting*. The students’ performance per topic was analysed by computing the percentage of an average score in all the questions under one topic. The average score of questions in each topic are grouped into three classes namely weak (0 – 29), average (30 – 64) and good (65 – 100).

The students’ performance per topic is presented below:

3.1 In *Construction materials, Site preparation, Foundation, Scaffolding and Shoring and Walls* (multiple choice items), there was one item from each topic. The performance in these topics was good as the percentage of students who scored the pass mark and above was 74.8 percent of all valid students.

3.2 Based on *Walls* (matching items), students were required to match descriptions against corresponding parts. The performance in this question was generally moderate as 54.05 percent scored the pass mark and above.

3.3 As for true/false questions based on *Walls* as a topic students were required to recall the facts from the statements. The performance for this question was generally good as 84.14 percent scored the pass mark and above.
3.4 The question on *Foundation*, the performance was poor as only 10.1 percent of the students were able to score the pass mark and above. This could be attributed to inadequate knowledge on the topic.

3.5 For the question based on *Construction materials*, the performance was generally good as 10.7 percent of the students scored the pass mark and above.

3.6 As for the question based on *Walls*, the performance was poor as only 9.26 percent of the students were able to score a pass mark and above. This could be attributed to inadequate knowledge on the topic.

3.7 The question based on *Scaffolding and Shoring*, the performance was generally poor as 6.40 percent of the students scored the pass mark and above.

3.8 Based on surveying, the topics tested included *Introduction to surveying laboratory, Surveying Instruments, Chain surveying and Chain and Compass Traversing*. The performance for these was generally poor as 21.43 percent of the students scored the pass mark and no student scored above the pass mark.

3.9 As far as Carpentry and Joinery is concerned, the topics tested included *Tools, equipment and Machines, Timber and Joints*. The performance was generally poor as 22.60 percent of the students scored a pass mark and no student scored above the pass mark.

3.10 The field of Brickwork and Masonry had the topics which included *Bricks and blocks making, Mortar, Bonding and Concrete*. The performance for this was generally average as 42.02 percent of the students scored the pass mark and above.

3.11 Painting and Signwriting field contained the topics which included *Tools, equipment, plants and brushes, Paint and Painting material, Painting technique, Water paint and Texture finishes*. The performance for those questions was generally average as 37.5 percent of the students scored the pass mark and above.

3.12 The field of Plumbing had topics which included Safety, *Tools, Equipment’s and plants, Materials, Bending and Threading and pipe
fitting. The performance was generally poor as 9.7 percent of the students scored the pass mark and above.

4.0 CONCLUSION

The general performance of students in the Civil Engineering paper for 2018 Form Two National Assessment (FTNA) was average.

The analysis of the students’ performance shows that out of the thirteen questions asked, eight were performed poorly and the other five questions were performed well. The students performed well in questions 1, 2, 3, 11 and 12. They had average performance or poor performance in questions 4, 5, 6, 7, 8, 9, 10 and 13. Poor performance in these questions indicates that the students had insufficient knowledge on the topics that were supposed to be covered at the level of form two in different subjects of specialization including Surveying; Carpentry and Joinery and Plumbing. See Appendix B which shows the performance on each question through charts in three categories; poor, average, and good.

The analysis of students’ performance per question indicated in percentages shows that questions on Surveying, Carpentry and Joinery and Plumbing were poorly performed by more than 75% of the students who attempted them. On the other hand, questions 1, 2, 3 and 5 had the performance of 37 to 84 percent as reflected in Appendices A and B.

This analysis shows that various stakeholders including students, parents, teachers, guardians, educational policy makers and the Government has a lot of work to do if the performance is to be improved. This report has shown is summary areas that demonstrated poor mastery and therefore they need emphasis to improve the performance. It is expected that this report will act as a catalyst for action.
5.0 RECOMMENDATIONS

5.1 Recommendations for Students

Based on the performance observed in this analysis, the following recommendations are worth making for students.

(a) Since it was observed that some students failed to adhere to the demands of the questions they attempted, it is recommended that future students be encouraged to read carefully the instructions before they can answer the questions.

(b) Because there are areas where students demonstrated lack of knowledge, it is advised that the future students be encouraged to search; practise and read relevant books/media in order to widen their knowledge.

6.1 Recommendations for Teachers

(a) To improve performance, teachers should be encouraged to set enough exercises and tests for their students before such students sit for the national assessment.

(b) Since students demonstrated all signs of having no knowledge on aspects that require prior practicals, it is recommended that practical skills be provided to students so that they can relate theories and practical and hence acquire the expected competences.
## Appendix A

### Analysis of the Students’ Performance Question-Wise

<table>
<thead>
<tr>
<th>S/N</th>
<th>Topic</th>
<th>Question Number</th>
<th>Percentage of Students who Scored 30% or More</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Walls</td>
<td>3 (True or false Items)</td>
<td>84.14</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Foundations, Scaffolding, Walls, Materials (Timber)</td>
<td>1 (Multiple Choice Items)</td>
<td>74.8</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Walls</td>
<td>2 (Matching Items)</td>
<td>54.05</td>
<td>Average</td>
</tr>
<tr>
<td>4</td>
<td>Brick and block making, mortar, bonding and concrete</td>
<td>11</td>
<td>42.02</td>
<td>Average</td>
</tr>
<tr>
<td>5</td>
<td>Paint and painting materials, painting techniques and texture finishers</td>
<td>12</td>
<td>37.50</td>
<td></td>
</tr>
<tr>
<td>6</td>
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<td>6</td>
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