THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEM RESPONSE ANALYSIS REPORT ON THE FORM TWO NATIONAL ASSESSMENT (FTNA), 2025

TECHNICAL DRAWING (VOCATIONAL STREAM

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(VOCATIONAL STREAM)

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FOREWORD

This report presents Students' Item Response Analysis (SIRA) in the Form Two National Assessment (FTNA) in the Technical Drawing subject, which was conducted in November 2025.

The Form Two National Assessment (FTNA) is a formative evaluation, which aims at providing feedback to teachers, students, curriculum developers and other education stakeholders on the extent to which the intended competencies were attained by students. It highlights areas of strength and weakness as demonstrated by students' responses to the assessment questions.

The report focuses on seven questions drawn from different specific competences of the syllabus, including *Constructing plane and diagonal scales*, *Constructing geometrical figures*, *Constructing isometric projection*, *Drawing in the first-angle orthographic projection*, *Drawing conic sections*, and *Sectioning of engineering components*. The analysis is based on students' actual responses and reflects their understanding, application of principles and adherence to standard Technical Drawing conventions.

The analysis of the students' performance helps to identify students' strengths and weaknesses for future improvement in their learning before sitting for the Form Two National Assessment (FTNA). It also identifies challenging areas for improvement during the teaching and learning process.

The National Examinations Council of Tanzania (NECTA) expects that the analysis and recommendations presented in this report will assist teachers in improving instructional approaches and help students to enhance their learning strategies.

The Council extends its appreciation to all individuals who contributed to the preparation of this report.

Prof. Said Ally Mohamed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report presents an analysis of students' performance in the Form Two National Assessment in the subject of Technical Drawing (Vocational Stream), which was administered in November 2025. The assessment evaluated the competencies attained by Form Two students in alignment with the Technical Drawing Secondary Education Syllabus issued in 2025.

The Technical Drawing assessment comprised of two sections, designated as Sections A and B, with a total of seven questions. All students were required to respond to every question in both sections. Section A contained four short-answer questions derived from the specific-competences of *Constructing plane and diagonal scales*, *Constructing geometrical figures* and *Constructing isometric projection* and was allocated a total of 40 marks.

Section B consisted of three questions, constructed from four specific-competences, which are *Drawing in the first-angle orthographic projection*, *Drawing conic section* and *Sectioning of engineering components*. Each question carried 20 marks therefore, the section had a total of 60 marks.

In this report, students' performance is classified into three categories: weak, average and good. These categories are determined based on score ranges of 0–29, 30–64 and 65–100 percent, respectively. The performance outcomes are presented by figures and tables employing a colour-coded scheme, in which red, yellow and green denote weak, average and good performance, respectively.

The analysis shows that the overall performance of Technical Drawing subject in 2025 was average, where 729 (51.34%) students passed. Figure 1 illustrates the overall grade-wise performance of the 1,420 students who sat for the Technical Drawing assessment in 2025.

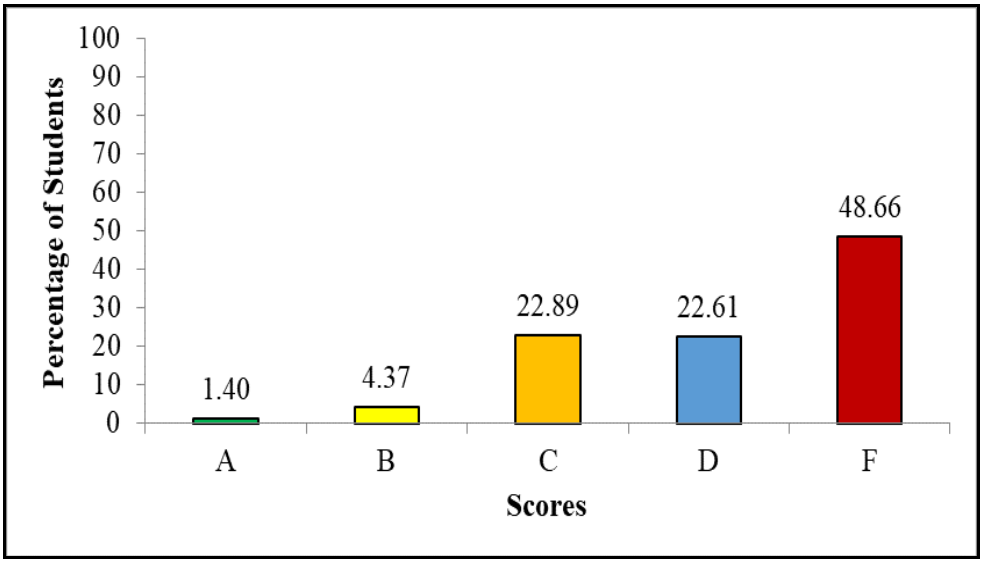


Figure 1*:* *The overall grade wise performance of students who sat for Technical Drawing subject*

2.0 ANALYSIS OF STUDENTS' PERFORMANCE IN EACH QUESTION

This part presents an analysis of students' performance based on the scores attained in each question. It includes a description of the question types, the main competencies and specific-competence from which the questions were developed, the competencies assessed in each question, the specific requirements of each question and the percentages of students whose performance was weak, average, or good.

2.1 Section A: Short Answer Questions

This section consisted of four questions, designated as Questions 1, 2, 3 and 4. Each question carried 10 marks, contributing a total of 40 marks. The questions were formulated from three main competencies: Scale, Geometrical Construction and Pictorial Drawings.

2.1.1 Question 1: Constructing Plane and Diagonal Scales

The students were required to calculate the representative fraction, draw a plain scale graduated in tens of kilometres and a unit kilometre up to 60 kilometres and mark a distance of 53 kilometres on the scale. The question was;

A rectangular plot 16 square kilometer area is represented in a map by a similar rectangle of area 1 square centimeters. Draw a plain scale to show units of ten kilometers and a unit kilometer which reads long enough up to 60 km. Find representative fraction of the scale and show the distance of 53 kilometers on it.

The question was attempted by 1,420 (100%) students whose scores were as follows; 1,123 (79.08%) students scored from 0 to 2.5 marks, 232 (16.34%) scored from 3 to 6 marks and 65 (4.58%) scored from 6.5 to 10 marks. Generally, students' performance in this question was weak since 1,123 (79.08%) students scored from 0 to 2.5 marks. This performance is summarised in Figure 2.

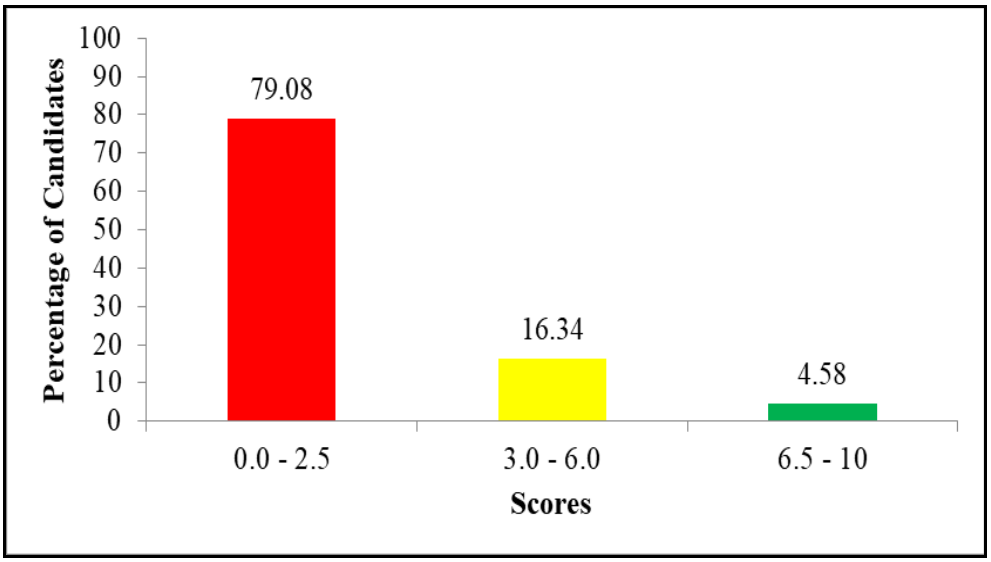
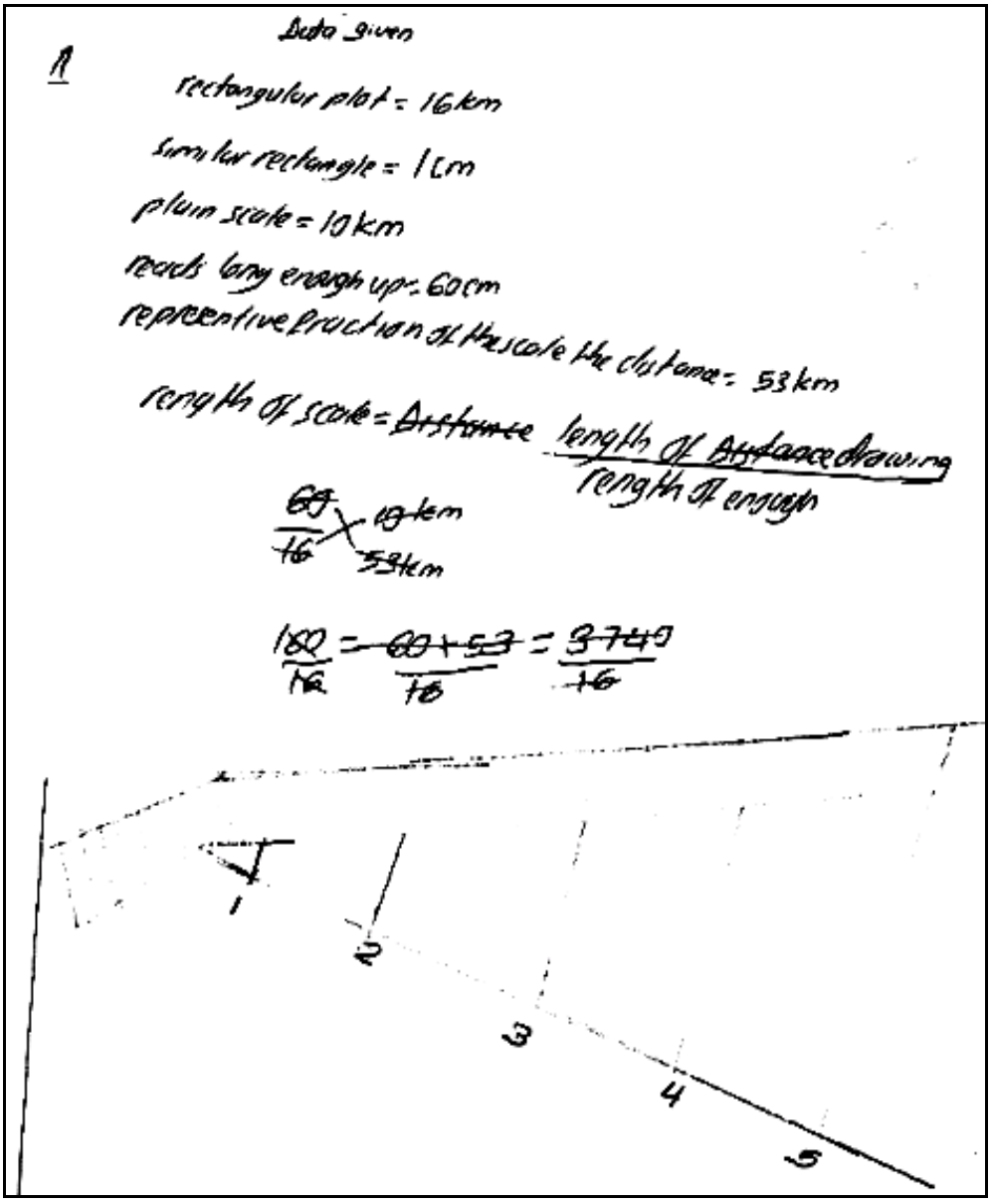


Figure 2: *The Students' Performance in Question 1*

The analysis shows that 1,123 (79.08%) students had weak performance by scoring from 0 to 2.5 marks. This weak performance was mainly due to several theoretical and practical factors. For those who scored 0 mark, failed to understand the requirements of the question, particularly, the relationship between the given areas and how to derive the Representative Fraction (RF). They were also unable to convert the given area units from square kilometres to square centimetres, which was needed in determining the correct RF of the scale. Furthermore, they failed to construct a plain scale. They were also unable to draw a scale long enough to represent distances up to 60 kilometres, divide it correctly into units of ten kilometres

and further subdivide it to represent 1 kilometer. This failure indicates inadequate understanding of scale construction procedures. In addition, most students failed to indicate the distance of 53 kilometres accurately on the constructed scale. Their responses indicated errors in marking the main divisions, subdivisions and in placing the correct reading on the left and right of zero. Poor drawing practices were also noted, including failure to use thick outlines for the main scale, incorrect line type and lack of neatness. Generally, students showed insufficient knowledge and drawing skills in the specific-competence of construction of scales. Their responses reflect weaknesses in applying mathematical concepts to drawing tasks, inadequate mastery of construction technique and limited technical drawing practices.

For those who scored either 0.5, to 2.5 marks, showed minimal awareness of the tested competence. Some drew a horizontal line to represent a scale, wrote units such as “km,” or partially stated the Representative Fraction (RF). A few of them divided the scale into parts or attempted to mark a distance, indicating slight familiarity with the basic concepts of constructing plane and diagonal scales thus they scored from 0.5 to 2.5. Despite these basic attempts, their understanding on the competence tested was largely inadequate. Most failed to correctly derive the RF due to inability to convert area units from square kilometres to square centimetres. The scales drawn were either too short or incorrectly divided, with wrong or uneven main divisions and subdivisions hence led to the scores of below average. Extract 1.1 is a sample of incorrect responses from the script of a student.



Extract 1.1: A sample of incorrect responses to Question 1

In Extract 1.1, the student failed to determine the Representative Fraction due to wrong unit conversion. The drawn scale was incorrect, irrelevant and did not give 60 kilometres with proper main and sub-divisions. He/she failed to indicate the distance of 53 kilometres.

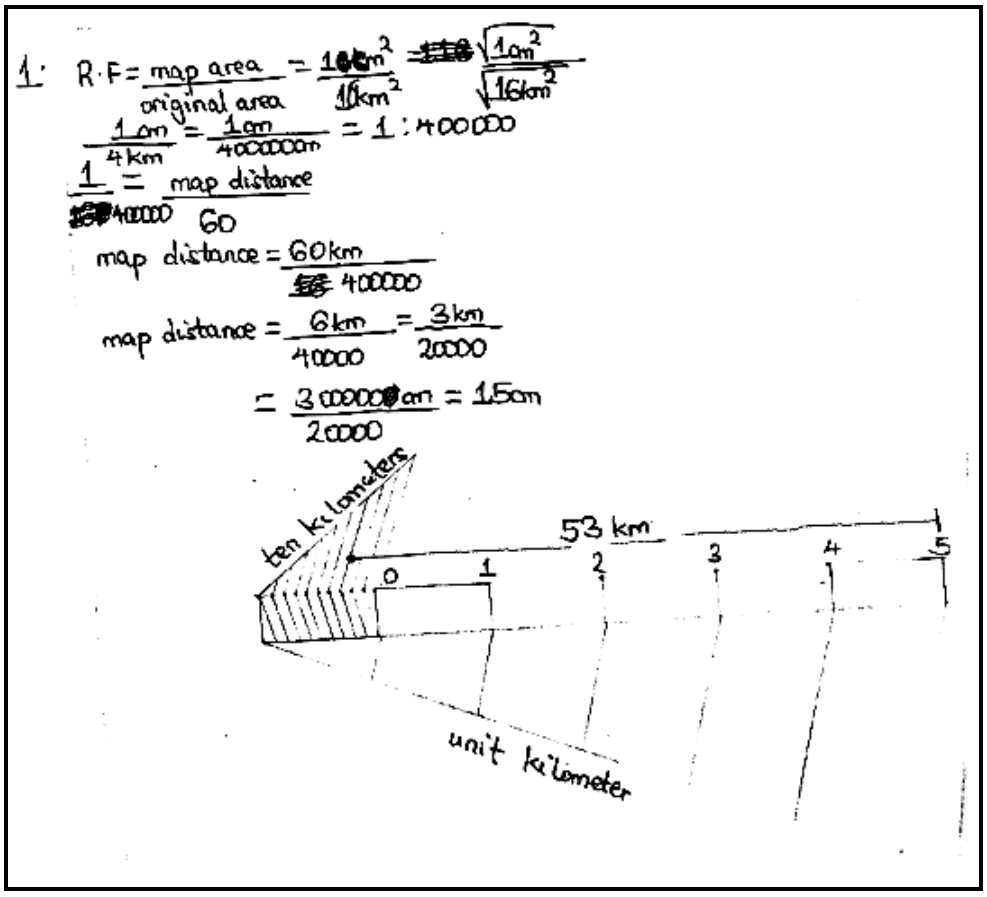
Further analysis shows that 232 (16.34%) students performed at an average level in the question. These students had partial understanding of the competence tested on *constructing plane and diagonal scales*. Most of

them were able to interpret the requirements of the question, including the need to construct a scale reading up to 60 kilometres, show units of ten kilometres and one kilometre and managed to determine the Representative Fraction (RF). However, their drawing techniques were not accurate. Some students calculated or stated the RF correctly but failed to construct the scale to the required length. Others drew the scale but did not divide it correctly into equal main divisions and subdivisions and in several cases, the distance of 53 kilometres was incorrectly. Furthermore, most students of this group did not observe standard drawing conventions, such as using thick main outlines, construction lines, proper lettering and clear representation of the RF. This shows that although they had basic understanding, their practical drawing skills were limited. Therefore, the overall performance of these students reflects partial theoretical understanding but lack of precision and application skills on scale construction and technical drawing standards, which led them to score average marks.

Despite the weak and average performance on this question, the analysis indicates that 65 (4.65%) students performed well in this question. Among these, a small group of students, 6 (0.4%) scored full marks (10 marks). These students understood the requirements of the question, including constructing a scale showing units of ten kilometres and one kilometre, determining the Representative Fraction (RF) accurately and correctly marking the distance of 53 kilometres. Their drawings were neat, accurate and fully adhered to standard drawing conventions, including the use of thick main outlines, proper construction lines and clear RF lines. This showed high ability in both theoretical and practical drawing skills.

Another group of students (4.58%) scored from 6.5 to 10 marks. These students also had good understanding of the question and were able to construct the scale, divide it into main and sub-units and attempt to indicate the required distance. However, their responses contained minor errors, such as; slight inaccuracies in dividing the scale into units of ten kilometres or one kilometre. Minor mistakes in marking the distance of 53 kilometres and inconsistencies in line weight, construction lines, or lettering. These small mistakes resulted in the deduction of some marks, but the students still showed mastery of the main concepts and construction techniques. Their performance reflected competence in the specific-competence of *constructing plane and diagonal scales*. Extract 1.2 is a sample of good

responses from the script of one of the students.



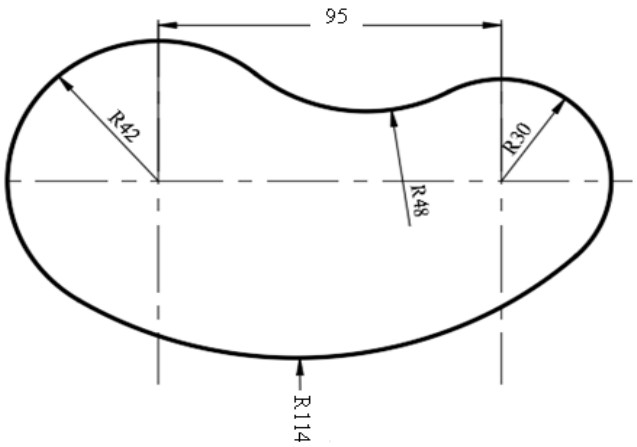
Extract 1.2: A sample of correct responses to Question 1

In Extract 1.2, the student was able to construct a plain scale showing units of ten kilometres and one kilometre. He/she managed to determine the Representative Fraction and construct relevant diagrams. Furthermore, he/she showed the required distance hence scored full marks.

2.1.2 Question 2: Constructing Geometrical Figures

This question was extracted from the specific-competence of *constructing geometrical figures*. The question intended to measure competences of employing geometric principle to construct a cam. The question was:

The figure shows a diagram of cam. By using geometrical principles, copy the diagram and show all constructions lines.



A total of 1,420 (100%) students attempted this question. The results of their scores indicate that 582 (40.99%) students scored from 0 to 2.5 marks, 504 (35.49%) students scored from 3 to 6 marks and 334 (23.52%) students scored from 6.5 to 10 marks. Generally, the students' performance on this question was average since 838 (59.01%) scored average or above. Figure 3 illustrates the given results.

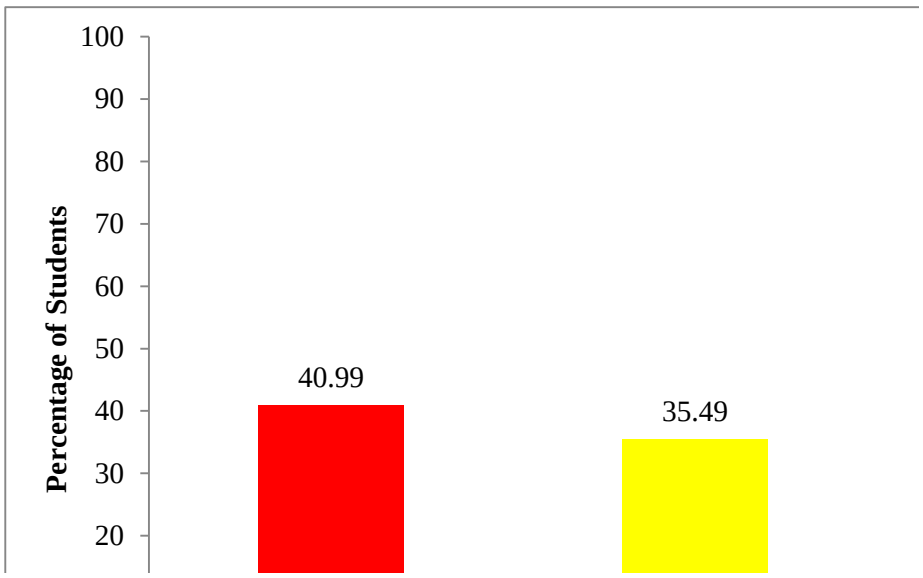
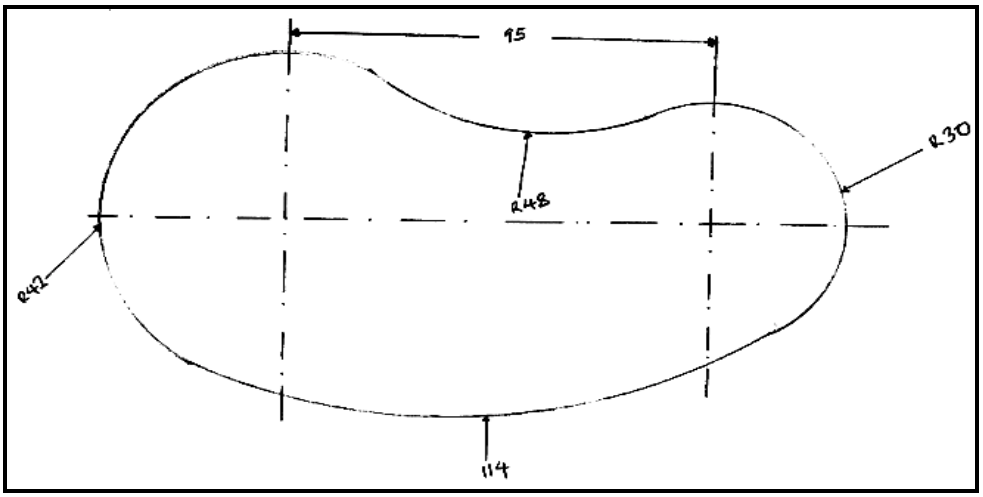


Figure 3: *The Students' Performance in Question 2*

The analysis shows that 334 (23.52%) students scored good marks in this

question. Further analysis shows that, among them 61 (4.30%) students scored fully marks. Those who scored all marks were able to construct two perpendicular center lines at 95 mm distance apart to each other on the center points and drew the circles points of 42 and 30 mm on these centers aligning on the same horizontal center line. Furthermore, they drew arcs tangents of 48 mm radius and inscribed circles by touching the circle internally and the other arc tangent of arc circumscribed the circles as it touched the circles externally. Additionally, they were able to draw the visible lines with regard to the profile of the required diagram hence they scored full marks. Analysis reveals that the students followed the necessary steps and employed the required drawing skills and techniques to redraw the figure by employing the geometric principles such as tangential arcs and circles.

Further analysis shows that 273 (19.23%) students scored between 6.5 and 9.5 marks. These students applied relevant geometrical construction techniques. Most of them correctly constructed the perpendicular centre lines, drew the 42 mm and 30 mm circles on the same horizontal centre line and applied tangential arcs of 114 mm internally and 48 mm externally, as they drew the inscribing and circumscribing of the two circles. Although they were able to draw most of the cam profile and visible outlines correctly, they failed to score full marks due to minor errors, including unclear or missing construction lines, slight inaccuracies in radii and arc connections, imperfect tangency and little adherence of drawing conventions such as line thickness and neat finishing. These weaknesses led to the loss of marks and therefore scoring less than 10 marks. Extract 2.1 is a sample of correct responses from the script of one of the students.



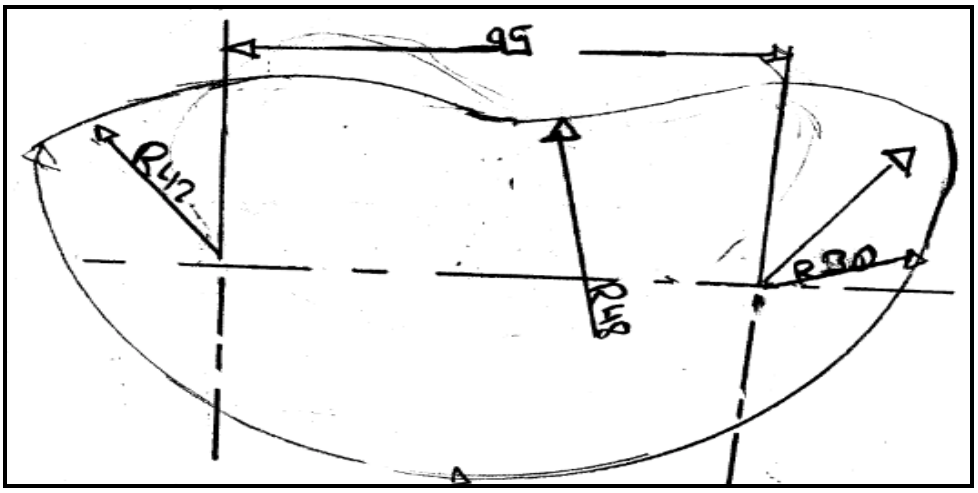
Extract 2.1: A sample of correct responses to Question 2

In Extract 2.1, the student correctly constructed perpendicular centre lines, drew the 42 mm and 30 mm circles on the same horizontal centre line and applied the required tangential arcs to inscribe and circumscribe the circles. The student accurately drew the visible outlines of the required profile and followed correct construction steps and drawing conventions.

Further analysis shows that 504 (35.49%) students obtained average performance. They were able to demonstrate basic understanding of the question by partially constructing the centre lines, circles and tangential arcs and produce the cam profile. However, they scored average marks due to inaccurate dimensions, incorrect or incomplete tangency, missing construction lines and poor observance of drawing conventions, which resulted in incomplete or incorrect constructions, as a result they ended up with average scores.

Further analysis shows that 582 (40.99%) students who scored from 0 to 2.5 marks showed limited understanding of the question and inadequate application of geometrical construction principles. Those who scored 0.5 and 1.0 mark made minimal attempts such as drawing unrelated sketches, a single centre line, or one incorrect circle. Students who scored from 1.5 to 2.0 marks managed to draw centre lines, circles, or arcs but with wrong dimensions, poor alignment, or incorrect tangency. Furthermore, those who scored 2.0 and 2.5 marks, most of them showed partial layout of the cam but failed to apply correct geometrical principles, construct lines and draw

conventions; which resulted in incomplete and inaccurate diagrams thus they scored few marks. Extract 2.2 is a sample of incorrect responses from the script of one of the students.



Extract 2.2: A sample of incorrect responses to Question 2

Extract 2.2 shows a student response with incorrect drawings in this question. He/she was not able to use the drawing skills and apply the drawing competence of constructing geometrical figures to provide correct drawing with regard to this question.

2.1.3 Question 3: Constructing Geometrical Figures

This question was extracted from the specific-competence of *constructing geometrical figures*. The question intended to measure competences of employing the concentric circle method to draw an ellipse with major and minor diameter. The question was:

By using the concentric circle method, draw an ellipse whose major and minor diameters are 100 mm and 50 mm respectively.

A total of 1420 (100%) students attempted question 3. The results of their scores indicate that 390 (27.46%) students scored from 0 to 2.5 marks, 297 (20.92%) students scored from 3 to 6 marks and 733 (51.62%) scored from 6.5 to 10 marks. Generally, the students' performance on this question was good since 1,030 (72.54%) scored average and above marks. Figure 4 illustrates the given results.

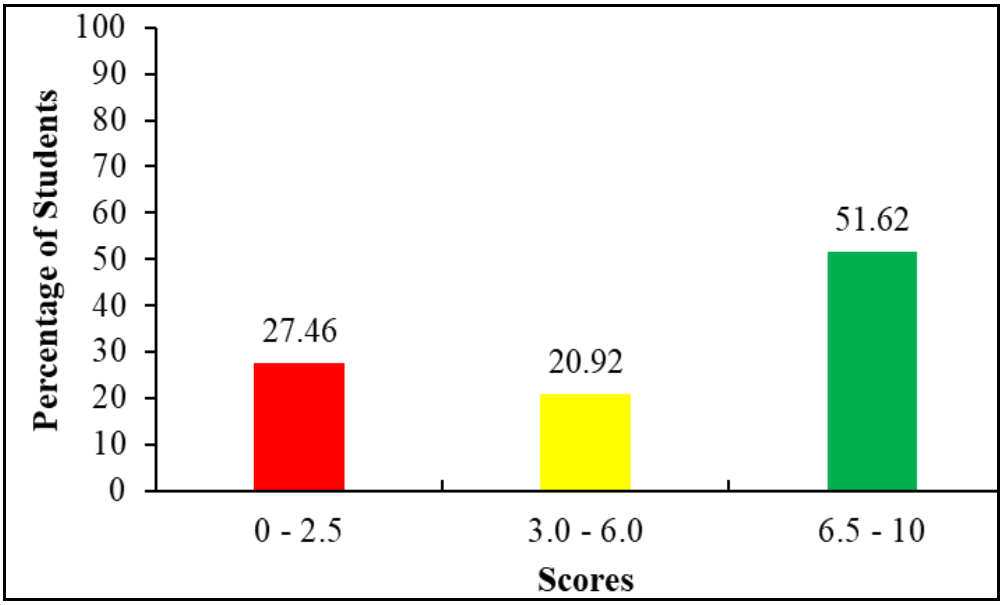
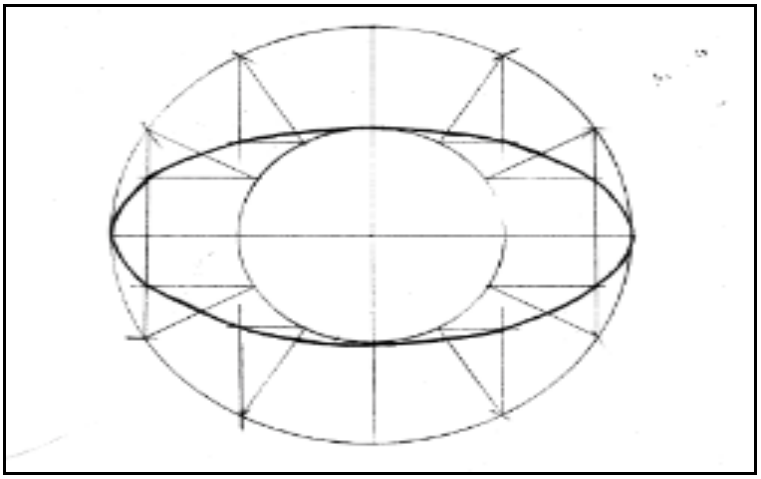


Figure 4: *The Students' Performance in Question 3*

The analysis shows that 733 (51.62%) students scored good marks in this question. Among them, 492 (34.65%) students scored all 10 marks. These students were able to draw the major axis of 100 mm and minor axis of 50 mm, intersecting at right angle at their midpoints. They accurately constructed two concentric circles using radii equal to half of the major and minor diameters. Furthermore, they divided the circles into equal parts and projected the corresponding points to obtain the smooth ellipse curve. These students were able to draw clear visible outlines and show all required construction lines; hence, they scored full marks. From their responses, it was evident that they followed the necessary steps and employed appropriate drawing skills and techniques in applying the concentric circle method.

Further analysis shows that 241 (16.97%) students scored from 6.5 to 9.5 marks. These students understood the question and applied relevant geometrical construction techniques. However, they failed to score full marks due to some minor errors, including inaccurate axis lengths, unequal division of circles, ineffectively projected points, incomplete construction lines, or lack of smoothness in the ellipse curve. These weaknesses led to loss of some of marks and therefore scoring less than full marks. Extract 3.1 is a sample of correct responses from the script of one of the students.



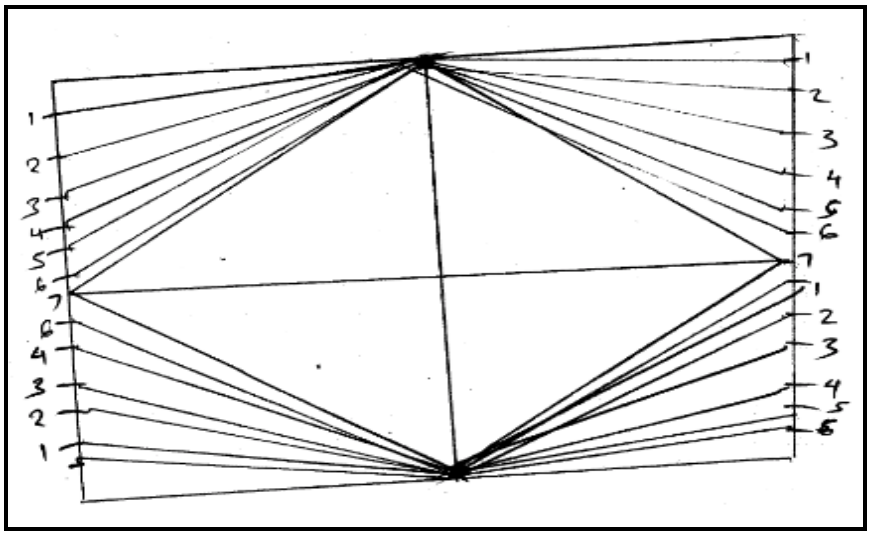
Extract 3.1 A sample of correct responses to Question 3

In Extract 3.1, the student correctly drew the major and minor axes intersecting at right angle at their midpoints. He/she accurately constructed the concentric circles, divided them into equal parts and used to obtain a smooth correct ellipse.

Further analysis shows that 297 (20.92%) students had average performance. These students partially understood the question as they only drew the axes and attempted to construct concentric circles. Some of them partially transferred points to form the ellipse, however, they scored average marks due to incorrect axis dimensions, improper construction of concentric circles, inaccurate projection of points, missing construction lines and little adherence to drawing conventions, resulting in incomplete or distorted ellipses.

Further analysis shows that 390 (27.46%) students who scored from 0 to 2.5 marks had limited understanding of the question requirement and incorrect application of the concentric circle method. Among them, those who scored 0.5 and 1.0 mark made minimal attempts such as drawing only one axis, a single circle, or unrelated sketches. Students who scored 1.5 and 2.0 marks managed to draw axes and circles but with wrong dimensions, improper alignment, or incorrect centre positioning. Furthermore, those who scored 2.0 and 2.5 marks showed partial layouts of the ellipse but failed to correctly divide the circles, project points, or produce a smooth

curve, resulting in incomplete and inaccurate drawings, hence scoring few marks. Extract 3.2 is a sample of incorrect responses from the script of one of the students.



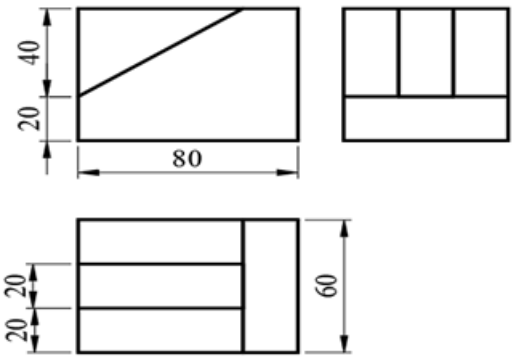
Extract 3.2: A sample of incorrect responses to Question 3

In Extract 3.2, the student confused between concentric circles method and rectangular method therefore he/she was unable to accurately construct the required ellipse.

2.1.4 Question 4: Constructing Isometric Projection

The question was set from the module of *Constructing isometric projection*. Students were asked to convert the orthographic projection views into isometric projection. The question was:

The figure shows an orthographical projection views of an object in first angle projection. By using the views, construct the object in isometric projection.



A total of 1,420 (100%) students attempted question 4. The results of their scores indicate that 402 (28.31%) students scored from 0 to 2.5 marks, 308 (21.69%) students scored from 3 to 6 marks and 710 (50.00%) scored from 6.5 to 10 marks. Generally, the students' performance in this question was good since 1018 (71.69%) of the students scored average and above. Figure 5 illustrates the given results.

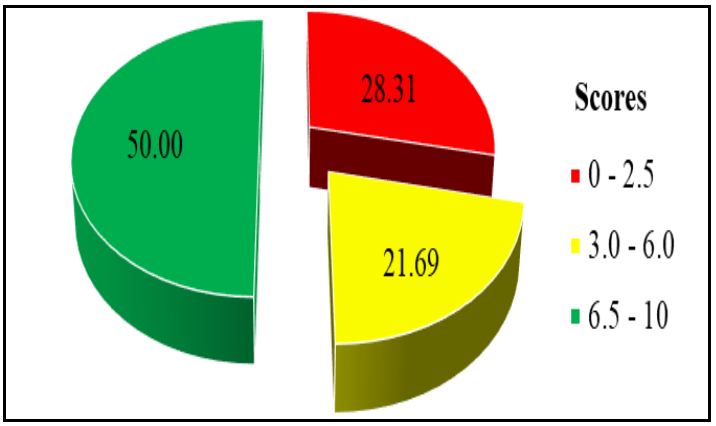
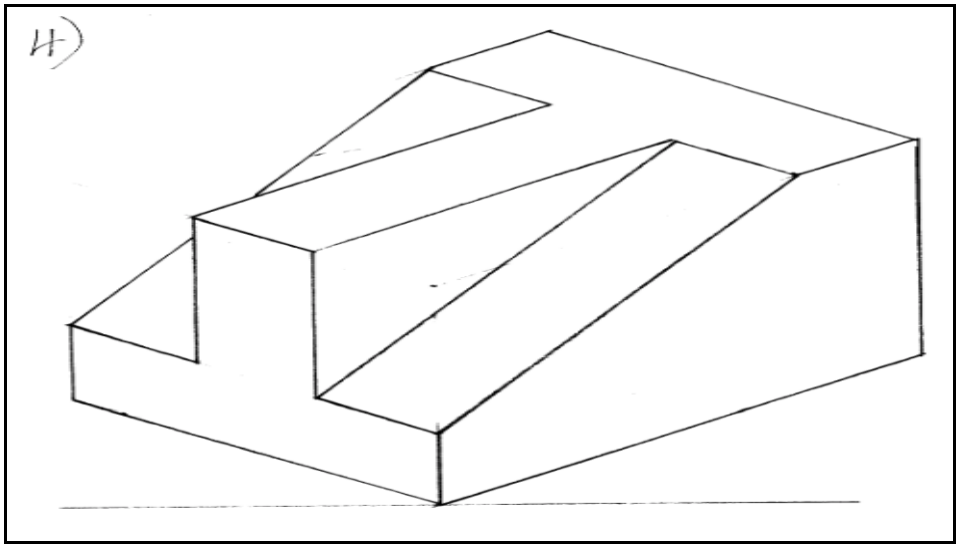


Figure 5: *The Students' Performance in Question 4*

The analysis of the performance on this question shows that 710 (50.00%) students scored good marks. Among them 121 (8.52%) students, scored full marks (10 marks). This group of students were able to interpret the orthographic views in first angle projection, drew the isometric axes and accurately transferred dimensions from the given views to construct the isometric projection of the object. They correctly showed the visible edges, maintained proportional dimensions and observed standard isometric drawing conventions. From their responses, it reveals that these students followed the necessary steps of constructing the isometric box and had the

required drawing skills, competence and techniques hence were able to convert orthographic views into a correct isometric projection.

Further analysis shows that 589 (41.5%) students within this group scored from 6.5 to 9.5 marks. These students understood the question and applied relevant pictorial drawing techniques. Most of them were able to correctly draw the isometric axes, transfer most dimensions from the orthographic views and produced a correct isometric form of the object. However, they failed to score full marks due to minor errors, such as slight dimensional inaccuracies, omission of some visible edges, incorrect line thickness, or minor distortions of shape. These weaknesses led to the loss of some marks and therefore scoring less than full marks. Extract 4.1 is a sample of good responses from the script of a student.



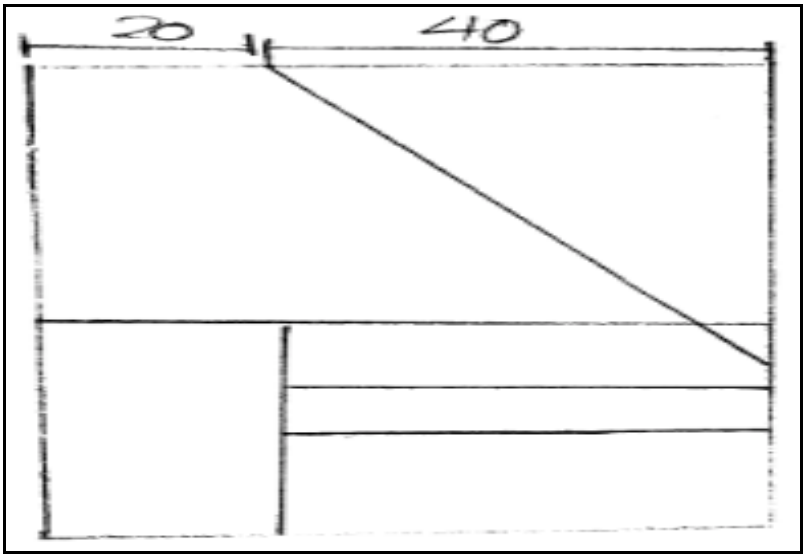
Extract 4.1: A sample of correct responses to Question 4

Extract 4.1 shows a sample of response from the student who was able to draw the isometric axes and accurately transferred dimensions to construct the correct isometric projection of the object.

Further analysis shows that 308 (21.69%) students managed to score average performance. These students understood the question, attempted to draw isometric axes and converted some features of the object from the orthographic views. However, they scored average marks due to incorrect interpretation of views, inaccurate transfer of dimensions, missing or wrongly drawn edges and little adherence to isometric drawing

conventions, which resulted in incomplete or partially correct isometric projections.

Further analysis shows that 402 (28.31%) students who scored from 0 to 2.5 marks had limited understanding of the question and improper application of isometric drawing principles. Those who scored 0.5 or 1.0 mark made minimal attempts such as drawing unrelated sketches, incorrect axes, or incomplete shapes. Students who scored 1.5 or 2.0 marks attempted to draw isometric forms but with wrong orientation, incorrect proportions, or missing major features. Furthermore, those who scored 2.0 or 2.5 marks showed partial construction of the object but failed to correctly interpret the orthographic views or apply isometric principles, resulting in inaccurate and incomplete drawings, hence scoring few marks. Extract 4.2 is a sample of incorrect responses from the script of one of the students.



Extract 4.2: A sample of incorrect responses to Question 4

Extract 4.2 shows a sample of response from the students who was not able to draw the isometric axes and ended up constructing incorrect view.

2.2 Section B: Structured Questions

This section comprised of three (3) structured questions. The questions were constructed from the specific-competences of, *Constructional orthographic projection* and *Constructional section views.* Each question carried 20 marks, making a total of 60 marks for the whole section.

2.2.1 Question 5: *Drawing in the First-angle Orthographic Projection*

This question was constructed from the specific-competence of *Constructional of orthographic projection.* The students were required to convert the given isometric block into first angle orthographic projection. The question primarily assessed the competence of students to view and draw the three sides of block in two dimensions and arrange them in first angle orthographic projection. The question was:

The given figure shows a block in isometric drawing. Draw front view from the direction of arrow A, top and end view in first angle projection.

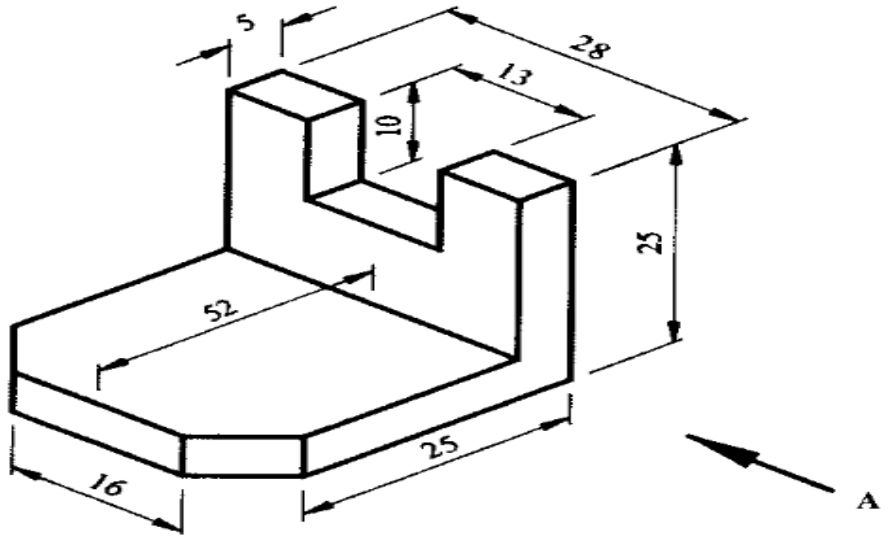


Figure 3

The analysis shows that, 1,420 (100%) students attempted the question, with 667 (46.97%) scoring 0 to 5.5 marks, 419 (29.51%) scoring 6 to 12.5 marks and 334 (23.52%) scoring 13 to 20 marks. These data are summarized in Figure 6.

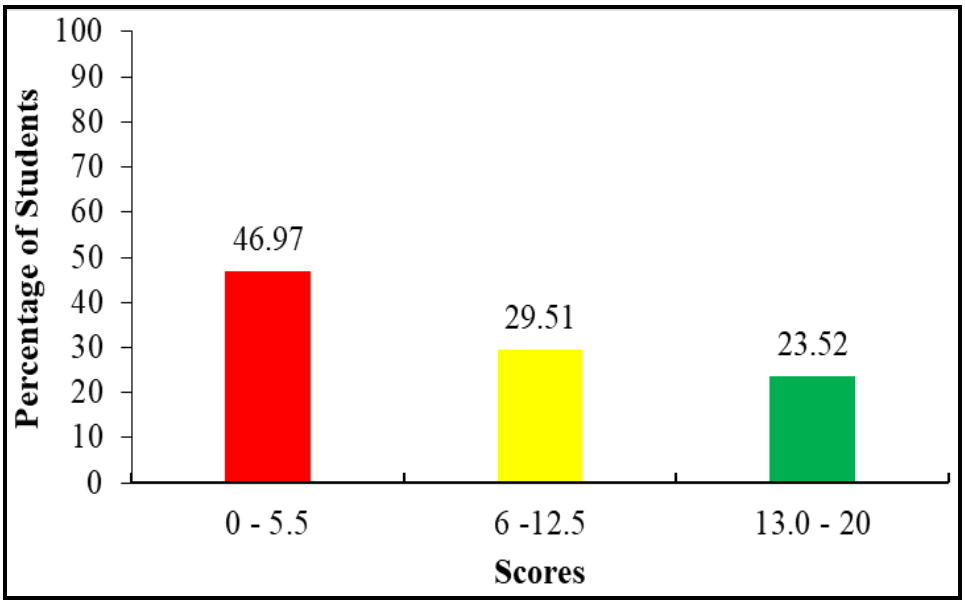
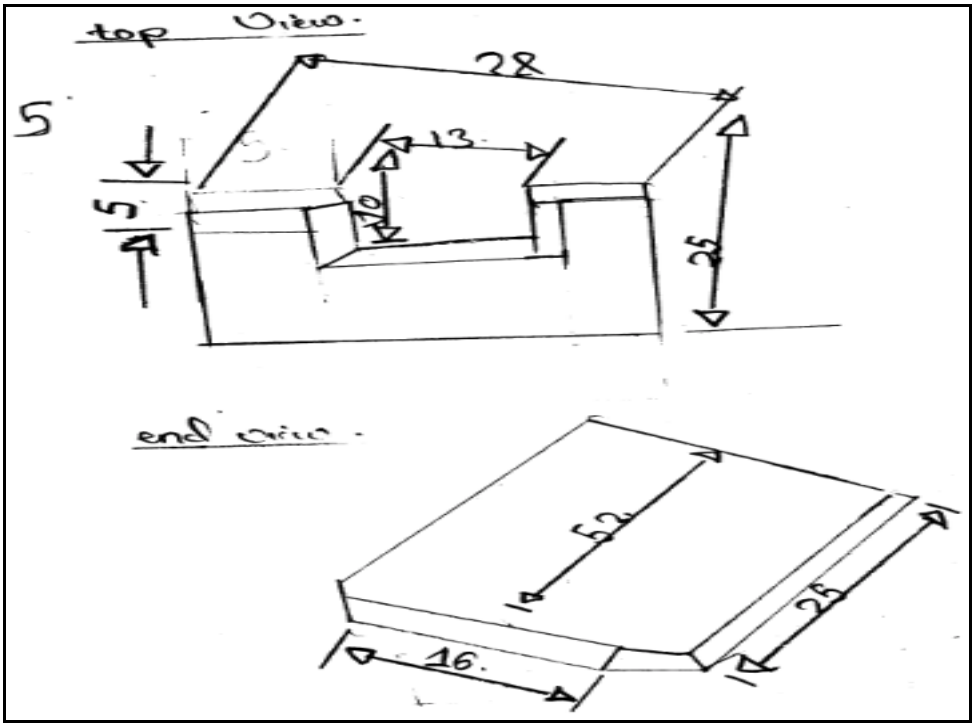


Figure 6: *The Students' Performance in Question 5*

The analysis shows that 667 (46.97%) students who attempted the question had weak performance, scoring between 0 and 5.5 marks. This level of performance indicates inadequate mastery of the specific-competence. Most of these students failed to correctly identify and draw the front view as seen from the direction of arrow A. Most of them were unable to visualize the three-dimensional block and translate it accurately into two-dimensional orthographic views. As a result, their drawings contained incorrect shapes, missing or extra features and wrong proportions.

Furthermore, the majority of students in this category showed un understanding of first angle projection conventions. Common mistakes included incorrect arrangement of views, confusion between first angle and third angle projection and improper positioning of the top and end views relative to the front view. In addition, most of responses reflected little technical drawing skills, such as absence of construction lines, incorrect use of visible and hidden lines, uneven line thickness and innateness. Generally, these students had limited ability, insufficient theoretical understanding of orthographic projection and insufficient adherence to technical drawing orthographic projection standards. Extract 5.1 shows a sample of incorrect responses from one of the students.



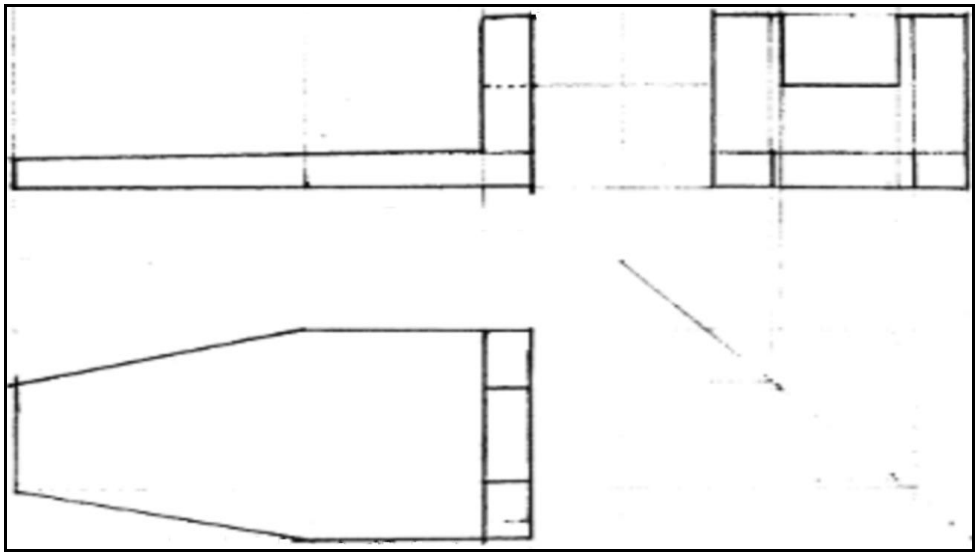
Extract 5.1: A sample of incorrect responses to Question 5

In Extract 5.1, the student failed to identify the correct front view from the given direction. He/she drew irrelevant drawing with regard to the question requirements.

Further analysis indicates that 419 (29.51%) students performed at an average level, scoring from 6 to 12.5 marks. This group shows partial understanding of *drawing in the first-angle orthographic projection*. Most of these students were able to interpret the question requirements and managed to draw the three required views. In most students' responses, the front view was drawn reasonably correctly, while the top and end views contained some errors such as the arrangement of views according to first angle projection, with some views misplaced or misaligned. Other common errors included inconsistency in line types. Although these students had some knowledge of orthographic projection principles, their application lacked accuracy and precision. Their work reflected moderate competence but insufficient mastery of technical drawing conventions hence they ended up with average scores.

Despite the general low and average performance, the analysis shows that 334 (23.52%) students performed well, scoring from 13 to 20 marks. Their performance indicates good mastery of the *drawing in the first-angle orthographic projection*. These students correctly identified the front view from the given direction, accurately drew the top and end views and arranged all views correctly in first angle projection. Their drawings were neat, well proportioned, well positioned and clearly presented, with correct use of construction lines, visible and hidden lines and proper alignment of views hence some of them 79 (5.6%) scored all 20 marks.

On the other hand, minor errors were observed in some of the students' responses including slight inaccuracies in proportions or small omissions of details, which led to minimal loss of marks hence some of the students in this group scored high but less than 20 marks. Overall, this group of students revealed good visualization skills, clear understanding of first angle orthographic projection and good application of technical orthographic projection drawing standards. Extract 5.2 is the sample of correct responses from script a student.



Extract 5.2: A sample of correct responses to Question 5

In Extract 5.2, the student correctly drew the front view from the given direction and accurately drew the top and end views. He/she arranged all views correctly in first angle orthographic projection. The student had good visualization skills and adhered to first angle orthographic projection drawing standards.

2.2.2 Question 6: Drawing Conic Section

This question was constructed from the specific-competence of *Drawing conic section*. The question measured ability of students to draw front view, top view and end view of a truncated cone. The question was:

The figure 4 shows a cone cut vertically by a plane. Study the diagram and draw the following:
(a) *Front view* (b) *Top view* (c) *End view showing the cut portion.*

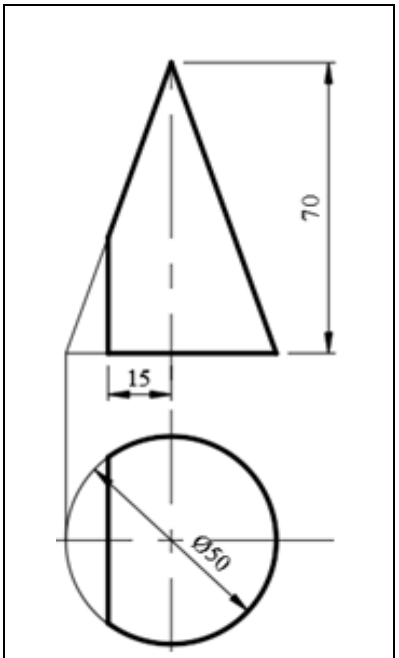


Figure 4

The question was attempted by 1,420 (100%) students out of which 1,074 (75.63%) scored from 0 to 5.5 marks, 232 (16.34%) scored from 6.0 to 12.5 marks and 114 (8.03%) scored from 13 to 20 marks. This analysis shows that the performance in this question was weak as 75.63 percent scored from 0 to 5.5 marks. Figure 7 presents the students' performance in this question.

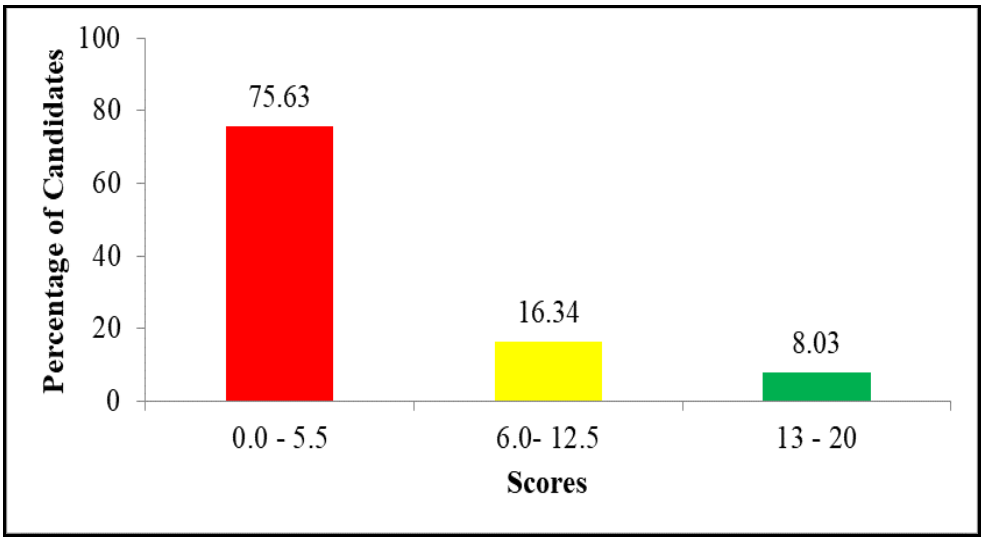


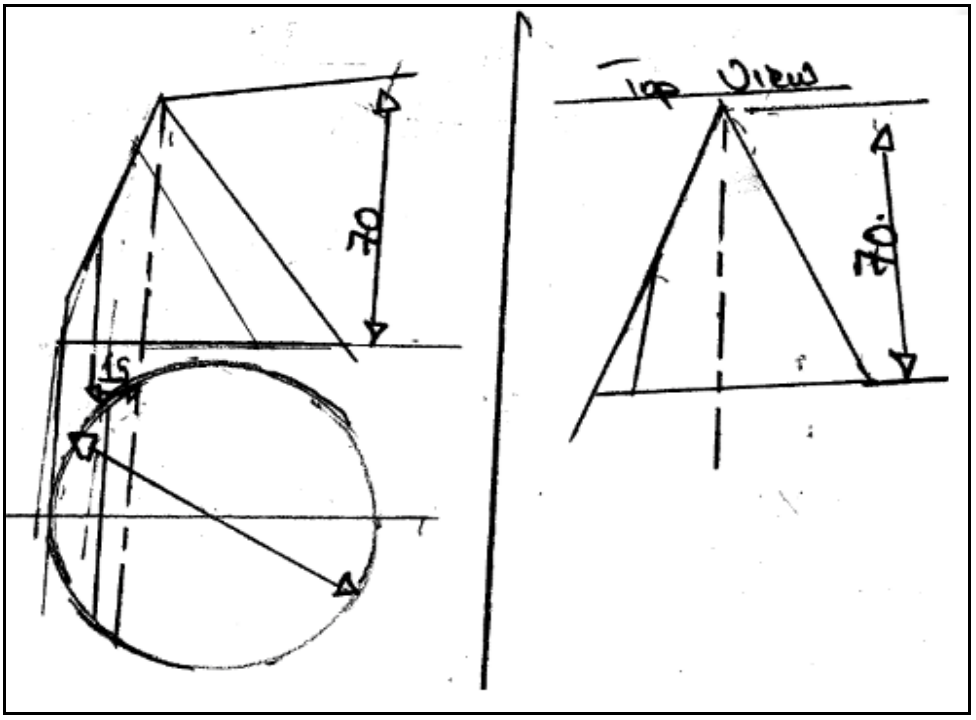
Figure 7: *The Students' Performance in Question 6*

The analysis of students who scored below average in this question shows that a large proportion of students had weaknesses in the specific-competence of *drawing conic section*, particularly in drawing sectional views of a cut cone. Out of the 1,420 (100%) students who attempted the question, 1074 (75.63%) scored from 0 to 5.5 marks, The weak performance was due to inadequate understanding of both the theoretical concepts and practical procedures involved in sectional drawing of solids. Most students were unable to interpret the given diagram of the cone cut vertically by a plane. As a result, they failed to draw accurately the required front view, top view and end view showing the cut portion. Most of them showed insufficient spatial visualization skills and could not relate the three-dimensional object to its two-dimensional sectional views so that they could draw the end view showing the cut portion.

Students who scored from 1 to 5.5 marks some of them did not understand the question requirements while others had partial ability to apply section-view drawing principles. Most of them attempted the question but produced incomplete or incorrect drawings of the front, top and end views of the truncated cone. In most cases, only one view was attempted, while the remaining views were either missing or poorly constructed. These students showed some awareness of technical drawing, such as drawing basic outlines of the cone or indicating a cut, but they failed to apply correct projection methods. Common weaknesses included incorrect positioning of

views, missing or wrongly drawn centre lines, improper representation of the cutting plane and failure to show the true shape of the cut surface. Section lining was often incorrectly applied or omitted.

For those students who scored zero marks, the analysis reveals complete incompetence in applying technical drawing knowledge and skills to the task. Some students merely reproduced the given pictorial figure using freehand sketching, without observing correct dimensions and projection principles. Others failed to indicate essential construction elements such as centre lines, correct horizontal and vertical reference lines, radial lines and the correct position and orientation of the cutting plane. Generally, the responses of these students reflected weak mastery of sectioning principles, insufficient understanding of projection of views and limited technical drawing skills. This indicates insufficient preparedness in the specific-competence of Drawing conic section, particularly cut cones. Extract 6.1 illustrates the responses given by one of the students who weakly attempted the question



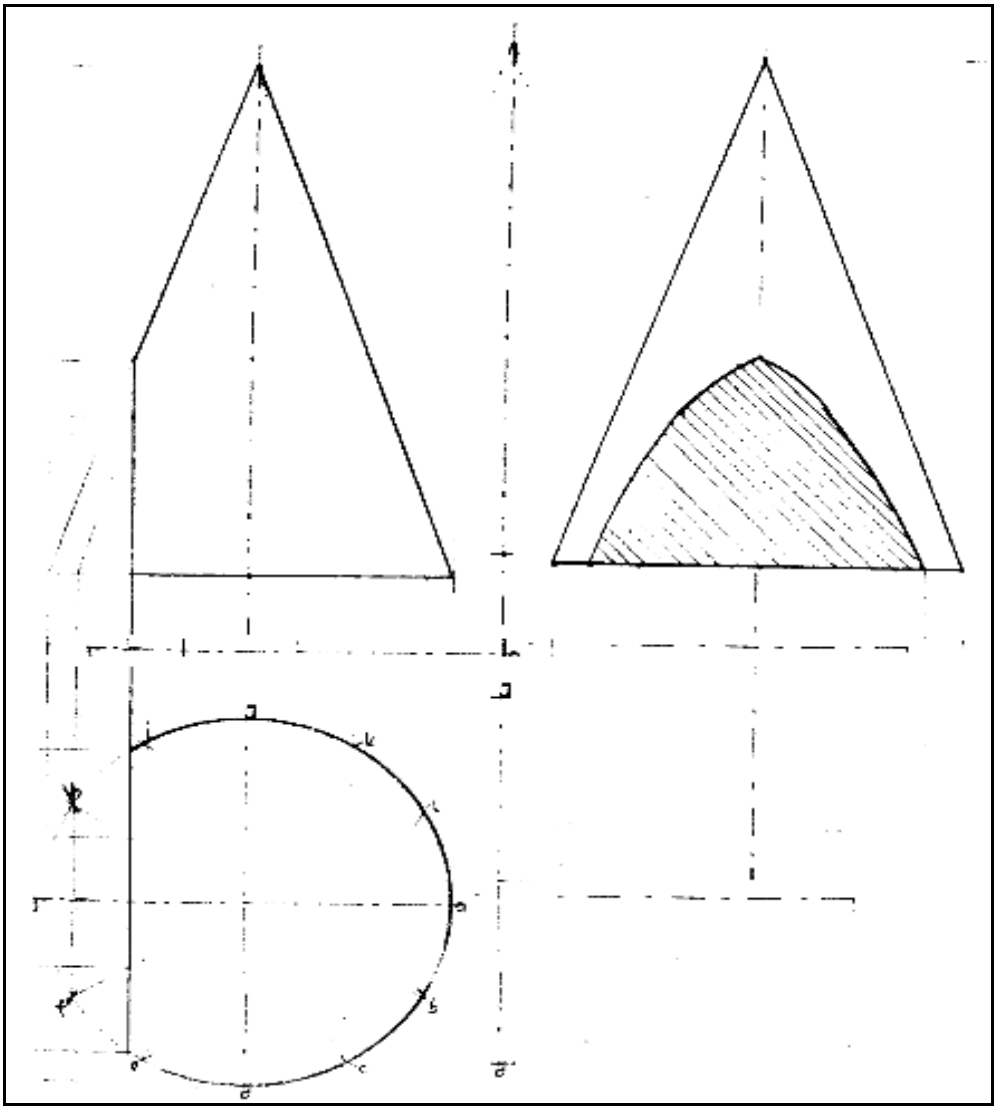
Extract 6.1: A sample of correct responses to Question 6

In Extract 6.1, the student failed to draw sectional drawing of a cut cone.

He/she failed to draw the required front, top and end views showing the cut portion and instead produced incomplete and incorrect drawings that did not adhere to sectional view and projection principles as per question requirements.

However, some students 232 (16.34%) scored average marks in this question. These students provided drawings with partial details. Most of them accomplished to present initial construction by drawing front view, top view and end view but failed to apply drawing skills to complete the line of construction as a result led to average scores. They managed to construct a cut front view but failed to present top view as well as end view. Other students were able to construct both cut front view and top view but failed to complete end view. Some of these students had insufficient knowledge, drawing skills and techniques in the module of constructing conic section. Therefore, they ended up scoring average marks.

Further analysis shows that 114 (8.03%) students managed to score good marks in this question. These students were able to draw correct drawings of both front view, top view and end view. They were able to apply drawing knowledge and skills to produce correct response to this question. They drew correct dimension of figure, correct centerlines as well as correct horizontal and vertical construction lines. They also drew complete front view, top view and end view with correct radial lines, positioning of cutting plane and line of intersection. Generally, their drawings were typically clear, with appropriate dimension and clear differentiation between the front view, top view and end views, which enable them to score the full 20 marks. For those who scored high but less than 20 marks did some mistakes, which led them, scoring below 20 marks. For example, the overall structure of drawing was good, but minor errors such as detailing or the exact positioning of lines, though did not affect the overall clarity and correctness of the drawings but reduced the scores from scoring all 20 marks. Extract 6.2 illustrates the responses given by one of the students who attempted correctly the question.



Extract 6.2: A sample of correct responses to Question 6

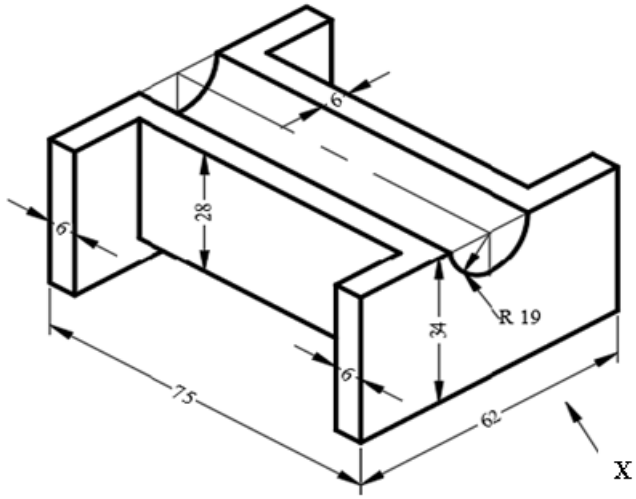
In Extract 6.2, the student correctly drew the front view, top view and end view with appropriate dimensions and centre lines. He/she accurately applied projection principles by correctly positioning the views and indicate the cutting plane.

2.2.3 Question 7: Sectioning of Engineering Components

This question was derived from the specific-competence of *sectioning of engineering components*. The students were required to study the pictorial object and draw a sectional front view, sectional side view and top view.

The question was designed to assess students' ability and skills to draw sectioned views. The question was:

The given figure is the diagram of object drawn in pictorial projection and has to be sectioned along and across front elevation. The front elevation is to be viewed in the direction of the arrow X and all cutting plan are perpendicular to the center of object. Study the diagram and draw the following:
(a) Sectional front view (b) Sectional side view (c) Top view



The question was attempted by 1,420 (100%) students, from which 1,016 (71.55%) scored from 0 to 5.5 marks, 342 (24.08%) scored from 6 to 12.5 marks and 62 (4.37%) scored from 12.5 to 20 marks. Generally, the students' performance in this question was weak, since only 404 (28.45%) of the students scored from average and above. This performance is summarized in Figure 8.

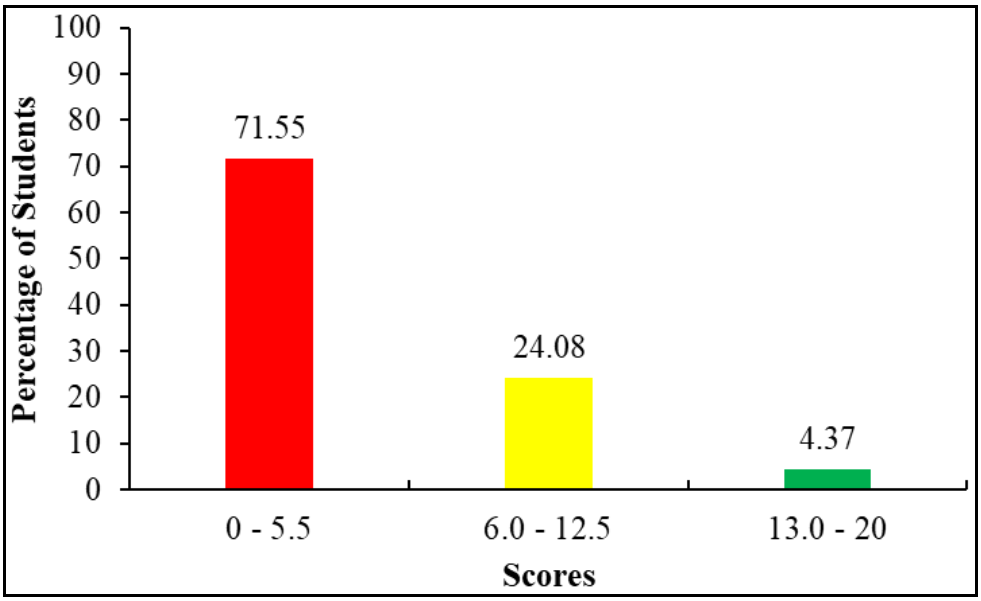


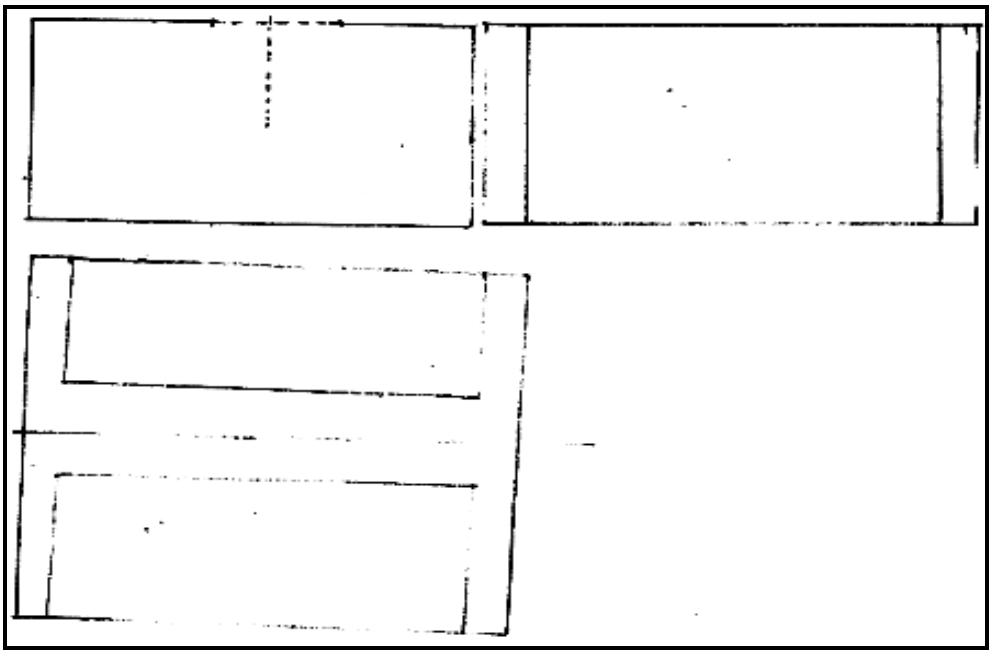
Figure 8: *The Students' Performance in Question 7*

The analysis of this question shows that the majority of students demonstrated weak performance in the specific-competence of *sectioning of engineering components*. The question required students to study a pictorial drawing of an object and correctly draw a sectional front view, sectional side view and top view with cutting planes taken along and across the front elevation and perpendicular to the centre of the object. Out of the 1,420 (100%) students, 1,016 (71.55%) scored from 0 and 5.5 marks, indicating weak performance.

This weak performance was contributed by both theoretical and practical weaknesses. Most of the students failed to understand the requirements of sectional drawing, particularly the concept of cutting planes and how sections are represented in Technical Drawing. Most of students were unable to visualize how the object would appear when sectioned along the given planes. As a result, their drawings showed incorrect shapes, missing features, or inclusion of parts that should have been removed by the sectioning process.

Furthermore, the majority of these students demonstrated difficulties in applying sectional drawing conventions. Common errors including failure to apply correct hatching, incorrect spacing or direction of section lines, omission of section lining and confusion between sectional and non-

sectional views. Most of the students also failed to correctly identify the front view in the direction of arrow X, leading to wrong sectional front elevations. In addition, poor drawing practices were observed, such as lack of construction lines, incorrect use of visible and construction lines and untidy presentation. Generally, these students showed insufficient knowledge and drawing skills in the specific-competence of *sectioning of engineering components*. Their responses reflected weak visualization ability, insufficient mastery of sectioning principles and limited Technical Drawing skills. Extract 7.1 is an example of responses from the student who had weak performance.



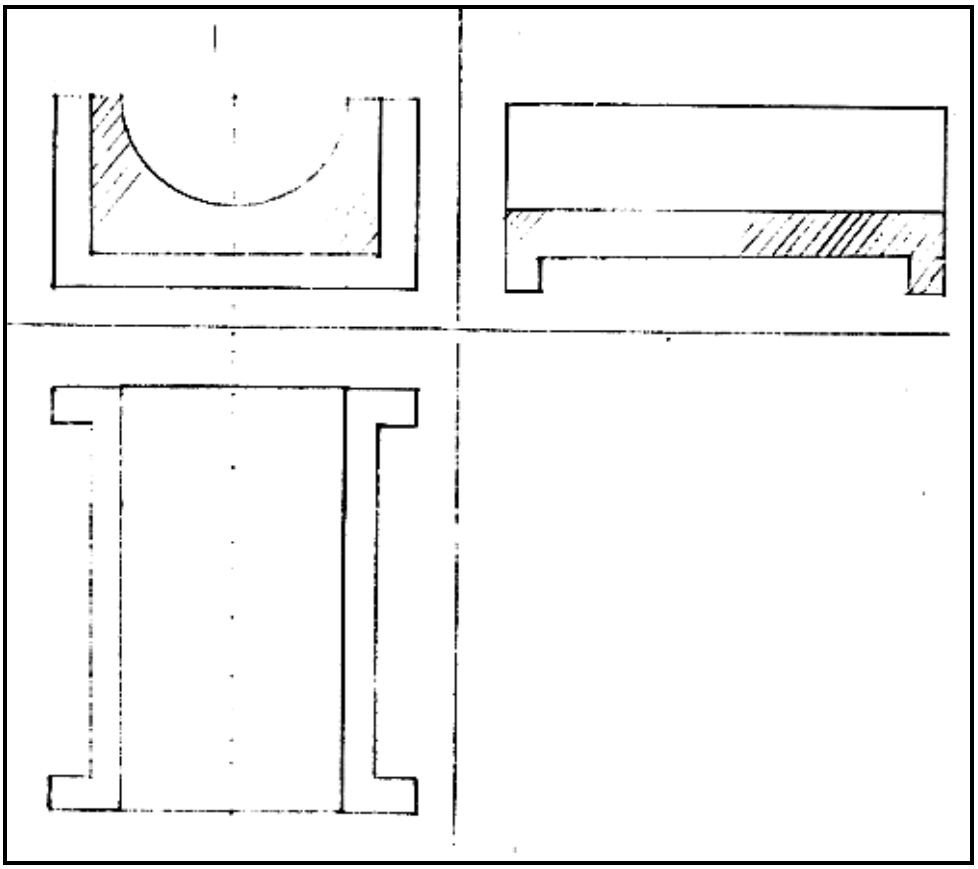
Extract 7.1: A sample of incorrect responses to Question 7

In Extract 7.1, the student drew incorrect and incomplete drawing. He/she failed to indicate the cutting plane and thus was unable to section the views.

Further analysis shows that 342 (24.08%) students performed an average level in the question. These students demonstrated partial understanding of sectional drawings. Most of them were able to interpret some of the requirements of the question, including drawing the three required views and attempted to apply sectioning. Their responses, reveals that, in most cases, the sectional front view and sectional side view were drawn correctly, but the other views contained errors. However, the application of

sectional drawing techniques was not accurate. Some students correctly showed the outline of the sectioned view but applied hatching incorrectly, such as uneven spacing, or hatching areas that should not have been sectioned. Others drew the views but failed to maintain correct alignment and projection between the front, side and top views. Additionally, most of students did not fully observe standard drawing conventions, including correct line weights, clear differentiation between cutting planes and views outlines, proper naming of cutting plane and neatness. This indicates that although these students had basic understanding of section views, their practical skills and accuracy were limited.

Despite the general weak and average performance, the analysis indicates that only 62 (4.37%) students performed well in this question, scoring from 13 to 20 marks. For those who scored all 20 marks, understood the requirements of sectional views, including correct interpretation of the cutting planes, accurate visualisation of the internal features and proper construction of sectional front and side views together with the top view. Their drawings were neat, accurate and adhered to standard technical drawing conventions. They correctly applied section lining with appropriate direction, spacing and used correct line types for visible, constructions details, maintained proper alignment and proportions between views. A few students in this category made minor errors, such as slight inaccuracies in hatching or minor omissions of details hence scoring between 13 and 20 marks, these mistakes did not significantly affect the overall quality of their work. Overall, these students showed good mastery of the specific-competence of *sectioning of engineering components*, good visualization skills and competence in applying both theoretical knowledge and practical sectioning techniques. Extract 7.2 is an example of good responses from one of the students' scripts.



Extract 7.2: A sample of correct responses to Question 7

In Extract 7.2, the student drew correct sectional views of front, side and a top view as required in the question.

3.0 ANALYSIS OF STUDENTS' PERFORMANCE IN EACH MODULE

The Form Two National Assessment (FTNA) in Technical Drawing subject had five main competencies and six specific-competences. These specific-competences are: *Constructing Plane and Diagonal Scales, Constructing Geometrical Figures, Constructing Isometric Projection, Drawing in the First-angle Orthographic Projection, Drawing Conic Section and Sectioning of Engineering Components.*

This report reveals that, students had good performance in the specific-competences of *Constructing Isometric Projection (71.69%)* in question 4 and *Constructing Geometrical Figures (65.77%)* in question 2 and 3.

However, the students had an average performance in specific-competences of *Drawing in the First-angle Orthographic Projection* (53.03%) in question 5. The good and average performance of the students was contributed by several capability mastered by students which are correct selection of line types and construction of basic shapes such as circles, arc, triangle and rectangular, as well as positioning of center lines, visibility, creating clear isometric and hatching lines.

Weak performance was observed in the specific-competence of *Drawing conic section* (24.37%) in question 6, *Sectioning of engineering components (28.45%)* in question 7 and *Constructing Plane and Diagonal Scales (20.92%)* in question 1. The reasons for their weak performance was due to misunderstanding of the questions' demand leading to irrelevant responses and poor hand control when constructing figure required. Appendix I presents the summary of students' performance (Question-Wise) in Technical Drawing, 2025 while Appendix II shows the percentages of the students' performance on individual question displaying weak, average and good scores.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The analysis of all seven questions in Technical Drawing subject on FTNA 2025 reveals varying levels of students' competence in Technical Drawing, with good performance in *Ellipse Construction* and *Isometric Projection*, but weak performance in *Constructing Plane and Diagonal Scales, Drawing in the First-angle Orthographic Projection and Constructing Sectional Views*. Most of students had insufficient understanding of mathematical concepts and drawing procedures in constructing plane and diagonal scales, as this weakness led to very low performance in question 1. Performance improved in questions 2, 3 and 4, where a considerable number of students correctly applied geometrical principles, concentric circle methods and isometric drawing techniques, indicating better mastery of these areas. However, challenges were evident in three-dimensional visualization and application of projection principles, particularly in converting between pictorial and orthographic views. Questions 5, 6 and 7 showed that most students had difficulty with first-angle orthographic projection and sectional views, especially in identifying correct views,

applying cutting planes and using section lines conventions. Moreover, across all questions, insufficient adherence to standard drawing conventions, such as construction lines, line types, proportions or sizes from dimensions and neatness, was a repeating weakness. Nevertheless, a small proportion of students consistently demonstrated high competence, accurate constructions and good drawing practices. Overall, the analysis indicates the need for strengthening both theoretical understanding and practical drawing skills, with particular emphasis on visualization, projection principles and adherence to Technical Drawing standards.

4.2 Recommendations

From the analysis made, the following recommendations are provided to students and teachers for improvements.

4.2.1 Recommendations to Students

(a) Students should strengthen their understanding of basic theoretical concepts in Technical Drawing, particularly scale construction, projection principles and sectional drawing.

(b) Students should be advised to practice mathematical conversions and calculations, such as unit conversions and determination of Representative Fraction, before attempting drawing tasks.

(c) Students should regularly practice drawing using correct procedures, tools and step-by-step construction methods to improve accuracy and confidence.

(d) Students need to improve spatial visualization skills by studying objects from different views and practicing conversion between pictorial, orthographic and sectional drawings.

(e) Students should consistently observe standard Technical Drawing conventions, including use of correct line types, construction lines, proportions, lettering and neatness.

4.2.2 Recommendations to Teachers

Teachers should:

(a) Emphasize the teaching of fundamental concepts and principles in Technical Drawing before engaging students in complex drawing tasks.

(b) Continuously, guide more practical sessions to allow students to practice scale construction, projections and sectioning under close

supervision.

(c) Integrate step-by-step demonstrations and use of visual teaching aids, models and real objects to enhance students' three-dimensional visualization skills.

(d) Continuously assess and provide timely feedback to help students identify and correct drawing errors early.

(e) Reinforce the importance of observing Technical Drawing standards, including correct line conventions, proportions and neat presentation.

(f) Be encouraged to attend professional development programs, workshops and sharing of best practices among teachers to improve instructional strategies and competence in Technical Drawing.

Appendix I

Students' Performance in Technical Drawing Subject (FTNA)

S/N	Competence	Specific-Competence	Question Number	Performance for each Competence		Remarks
				Percentage of Students who Scored 30% or more	Percentage of Students who Scored 30% or more	
1.	Constructing pictorial drawing	Constructing isometric projection	4	71.69	71.69	Good
2.	Drawing plane geometry	Constructing geometrical figures	2	59.01	65.77	Good
			3	72.54		
3.	Constructing orthographic projection	Drawing in the first-angle orthographic projection	5	53.03	53.03	Average
4.	Constructing sectional views	Drawing conic section	6	24.37	26.41	Weak
		Sectioning of engineering components	7	28.45		
5.	Scale drawing	Constructing plane and diagonal scales	1	20.92	20.92	Weak

Appendix II

Students' Performance on Individual Question