



**L-Università
ta' Malta**

**MATSEC
Examinations Board**



Examiners' Report

**IM ENG. DRAWING & GRAPHICAL COM.
First Session 2023**

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A. STATISTICAL INFORMATION

The total number of candidates who registered to sit for Engineering Drawing and Graphical Communication was 81.

Table 1 shows the distribution of grades for the First 2023 session of the examination.

| GRADE | A | B | C | D | E | F | ABS | TOTAL |
|------------|-----|-----|------|------|------|------|------|-------|
| NUMBER | 3 | 3 | 16 | 9 | 14 | 24 | 12 | 81 |
| % OF TOTAL | 3.7 | 3.7 | 19.8 | 11.1 | 17.3 | 29.6 | 14.8 | 100 |

Table 1: Distribution of grades for IM Engineering Drawing & Graphical Communication 2023, First Session.

B. COMMENTS

Section A.

Candidates had to answer FOUR questions from this section.

Question 1. Development by triangulation. (13 marks)

Two orthographic views and a three-dimensional view of a cake box were presented with the question. The base of the box had the shape of a square and the top of a right octagon, with the flat unequal sides tapering from the square base to the octagonal top. The sides consisted of four triangles and four quadrilaterals. A good number of candidates attempted this question and managed to copy the given views correctly. Some candidates did not set out triangles on the two views and did not even annotate the views with letters and numbers. Some presented the development of a square prism and an octagonal prism.

Questions of this type require the knowledge of true lengths. True lengths and inclination of lines is a very important topic which has a bearing on the subject of development, namely the relationship which the elevation and plan of a line have to its true length. Candidates must remember and understand the method on how to construct the true length and inclination of a line. Candidates had to draw a true length diagram to find the true lengths of the sides of the triangles which make up the sloping surface. Some candidates found the true lengths of the sloping lines on the given views, but this method leaves the two views with confusing intersecting lines. Candidates are encouraged to draw a separate true length diagram, where all the true lengths are neatly presented in a logical, fully annotated system. Markers noted that a minority of the candidates presented the development of the pattern without finding the true lengths of the various slant heights, while others were not familiar with the triangulation method. The presentation of half the surface development was poor and very few solutions used the proper types of lines, symbols and annotations.

| 1 to 6 | 7 to 12 | Full marks | Not attempted |
|--------|---------|------------|---------------|
| 35 | 13 | 3 | 18 |

Question 2. Conics treated as a locus of a point. (13 marks)

As an introduction to this question, a practical example was illustrated, the first showing a heat sink unit installed on a computer, the second showing detail of one fin of the unit consisting of the conical curves. Candidates familiar with the syllabus, know very well how the three conics sections are explained, going in detail with the methods and fundamental principles that are to be studied for this topic.

The profiles of the upper branch of the two curves, the hyperbola and the ellipse were to be constructed using a longitudinal transverse axis, a directrix and a focus. Both conics had to be treated as a locus of a point. Candidates were shown on a diagram how the solutions were to be presented. The two conics were to be constructed on two separated drawings, one next to each other on the same page, leaving space for annotations and neat construction lines showing how the locus of the point was plotted.

Not all candidates copied and completed the data shown on the diagram, stating the eccentricity of the conic. Annotations to the solutions were scarce, some untidily written. The intersecting arcs and lines locating the positions of the points of the conics were not presented in a neat manner. Candidates are urged to leave light construction lines showing the method used, outline the conic curves, by a smooth bold thin curve. A lack of understanding of the Standards Dimensions was evident, for dimensions showing the ratio of the conic were ignored.

| 1 to 6 | 7 to 12 | Full marks | Not attempted |
|---------------|----------------|-------------------|----------------------|
| 14 | 40 | 3 | 12 |

Question 3. Spur gear wheel teeth. (13 marks)

Candidates were to draw two small tables, one showing neatly the given gear data and another table inputting the derived gear data with the necessary calculations for the spur wheel gear teeth. A scale of twice full size, was recommended, but some candidates failed to make a note of this. It was pleasing to see at least some candidates using the technical terms such as pitch point, addendum and dedendum on the diagram.

A number of candidates who attempted this question did a little more than copying the given gear data and the conventional representation of the given diagram. The derived data was not always correct, and some forgot the method to include the base circle on the diagram. The construction of the flank face profile of the true involute form was untidily presented even though it was suggested that they were to draw this separately. Candidates familiar with this type of problem managed to produce an excellent solution well and accurately drafted.

| 1 to 6 | 7 to 12 | Full marks | Not attempted |
|---------------|----------------|-------------------|----------------------|
| 4 | 20 | 4 | 41 |

Question 4. Prismatic hole in a right cylinder. (13 marks)

A popular question with most candidates demonstrating an ability to produce the curves of intersection on a right cylinder. The majority of the candidates copied the three given views, dividing the cylinder into twelve equal parts, including numbers on the three views. The triangular prismatic hole was reproduced accurately, but most candidates did not notice that not all of the corners of the triangle intersected the generators. To determine the curves of intersection accurately, the generators must be drawn passing through the extreme points of the triangle. Responses given indicated that this problem might have confused some of the candidates, leaving interrupted gaps. In some cases, the upper part on the front view of the complete solution was constructed correctly, however, the lower half was shown distorted or incomplete. Marks were deducted, on some scripts, for hidden details were not included on the final presentation.

| 1 to 6 | 7 to 12 | Full marks | Not attempted |
|---------------|----------------|-------------------|----------------------|
| 26 | 25 | 1 | 17 |

Question 5. Light beam. (13 marks)

Due to its importance, as expected, this was a popular question. Most candidates correctly set out the given space diagram, using the suggested scale, and produced a polar diagram. Bow's notation was very poorly written, very few presented annotations neatly, others did not include these annotations. Some candidates were not familiar with the convention of using upper case letters on the space diagram and lower-case letters to correspond on the force diagram. More attention and accuracy need to be devoted the funicular polygon, especially the types of lines drawn. Most of the results of the tension in the cable and the reaction of the hinge were incorrect. The funicular polygon had to be drawn to determine the position of the resultant of 120 N and 80 N point loads.

| 1 to 6 | 7 to 12 | Full marks | Not attempted |
|---------------|----------------|-------------------|----------------------|
| 30 | 14 | - | 25 |

Section B.

Candidates had to answer ONE question from this section.

Question 6. Pipe Vice. (24 marks)

There were a good number of well and accurately drawn solutions, showing that they were familiar with the basic knowledge of engineering drawing practice and a good understanding of the conventional representation of sectional views. Valuable marks were deducted on these solutions for not labelling the views or features not conforming to the standards. Other candidates got a lower grade for they showed that they were not familiar with sectional views. These candidates presented solutions using pencils of too soft a grade and not sharp enough to produce consistent lines.

Candidates were to answer part (a) by presenting a Section X-X of the assembled Pipe vice and (b) an outside view of the end elevation. The pipe vice was illustrated by an exploded view showing how all the parts were to be fitted together to assemble the vice. Besides, a short note explained the sequence how each part was to be fitted. Candidates were encouraged to read the question carefully, yet it seemed that some candidates did not read and follow these instructions. Some candidates presented the Section X-X of the pipe vice only, ignoring the outside view of the end view.

The sectional view was inaccurately drawn, omitting the hollow base, the vertical centre line on the left for the two holes, the hole on the right for the securing screws and the cylindrical hole on the top. Tangents on the tee-shaped web on the left were not drawn neatly. The sliding vee piece and the clamping spindle were incorrectly placed on the main body. Candidates were inconsistent and confused which item was to be cross-hatched, forgetting the sectioning principles of features that were to be cross-hatched.

| 1 to 11 | 12 to 23 | Full marks | Not attempted |
|----------------|-----------------|-------------------|----------------------|
| 14 | 31 | - | 24 |

Question 7. Roller-end follower and cam Assembly. (24 marks)

This question was the least popular question in the paper. Candidates are expected to be able to produce assembly drawings from given exploded pictorial views. They are also expected to be familiar with sectional views, types of screw fasteners and various conventions. This section may also include topics listed in the core section of the syllabus.

Candidates were to carefully read the question and study the diagrams shown on the given A3 sheet. Those candidates familiar with the syllabus noticed that the main topic in this question concerned types of cams, followers and displacement diagrams.

As an introduction to the question, a mechanism operating a roller-ended follower on a cam was shown pictorially. To visualise better how the mechanism functions and is assembled, the parts were shown detached from each other. A short note on each item was included with the question.

Candidates were to copy the given plan of the roller follower mounted on the follower rod retained by a screw and assembled to the base bracket. The cam shaft and the 35 mm least radius of the cam was to be copied as shown in the given figure.

A few candidates lost valuable marks when constructing the uniform acceleration and retardation graph, while the rest managed to present a neat and accurately drawn displacement diagram. The cam profile was satisfactorily drawn.

The solution to the last part of the question was disappointing, for the sectional view was not drawn with sharp thin lines, especially the outside view of the stepped and threaded end of the screw. Section lines on local section views require patience to present equally spaced section lines.

| 1 to 11 | 12 to 23 | Full marks | Not attempted |
|---------|----------|------------|---------------|
| 6 | 6 | - | 57 |

Section C.

Candidates had to answer ONE questions from this section.

Question 8: Poster Design. (24 marks)

This question tested the candidates on their knowledge of graphical analysis, comparison, and presentation of data, and on methods of graphical illustration. The candidates had to design a poster on behalf of a private green company named HWM (Hazardous Waste Malta), who are planning to start a business collecting and disposing hazardous material in Malta safely and efficiently. HWM promised expert and professional solution for transporting and managing toxic waste to protect the environment. In advance of their investment, they analysed some data from the Malta National Statistics Office on waste generation by year and category.

Most candidates did well in this question, some short comings being:

- For the poster heading, several candidates did not use an appropriate typography.
- Some graphic app icons to be used as a mobile phone application were loaded with small drawings making it difficult to understand the theme which was green business that collects and disposing hazardous material in Malta safely and efficiently. Ideally the candidates should draw unique graphic app icons, simple and with a visual and effective colour scheme reflecting the theme.
- A number of candidates did not colour-code or label the information conveyed by the bar chart, line graph and pie chart. In fact, the title and other essential information were not always present.
- On the line graph, some candidates did not draw straight lines but used a wobbly curve.
- A number of candidates did not know how to draw a line graph, many starting from the origin and others drawing horizontal lines for each year.
- A number of candidates constructed another bar chart instead of the line graph.
- A number of candidates did not measure the correct angle while constructing the pie chart.
- Others did not use colour and shading to render the poster.

| 1 to 11 | 12 to 23 | Full marks | Not attempted |
|---------|----------|------------|---------------|
| - | 16 | - | 53 |

Question 9: One-point estimated perspective. (24 marks)

In this question the candidates were given an isometric drawing and a third angle orthographic projection of a teenager's bedroom. The room consists of a bed with storage behind the headboard, an overhead shelf, a four-door wardrobe with drawers, a small desk and a window.

Most of the candidates were well-prepared for this question. Other candidates, however, lost marks due to the following shortcomings:

- 1) Some candidates lost marks in determining the picture frame of the one-point perspective which should have been 400 mm by 270 mm.
- 2) A good number of candidates found difficulty in constructing the correct foreshortened depth of the room in one-point perspective. These candidates did not attain the foreshortened depth using intersects between the orthogonal lines converging to the vanishing point and the diagonal on the floor of the room.
- 3) Several candidates found a problem in constructing the overhead shelf in one-point perspective.
- 4) Several candidates found a problem in constructing the corner wardrobe in one-point perspective.
- 5) Some did not do the rendering.

| 1 to 11 | 12 to 23 | Full marks | Not attempted |
|----------------|-----------------|-------------------|----------------------|
| 7 | 39 | 3 | 20 |

General comments

It should be noted that those candidates who scored the higher marks made good use of annotated sketches and diagrams, besides showing that they had a good understanding of most of the topics. Their answers were both clearer and more precise.

Chairperson
Examination Panel 2023