



**L-Università
ta' Malta**

**MATSEC
Examinations Board**



Examiners' Report

IM Eng.Drawing & Graphical Communication

Main Session 2024

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A. STATISTICAL INFORMATION

The total number of candidates who registered to sit for IM 09 Engineering Drawing and Graphical Communication was 95.

The table below shows the distribution of grades for the May session of the examination.

GRADE	A	B	C	D	E	F	ABS	TOTAL
NUMBER	0	3	4	15	26	34	13	95
% OF TOTAL	0.0	3.2	4.2	15.8	27.4	35.8	13.7	100

B. GENERAL REMARKS

The board of examiners feel that, in general, the candidates need to prepare better for this examination. This subject requires continuous practice to improve the retention of the topics covered. This will increase efficiency in working and in problem solving within the examination time constraints. It is important that the examination questions are read carefully and fully understood.

The candidates fared best in section 'C', garnering an average of 14/24 marks. Most of these candidates chose the perspective question. Better results could have been achieved if the perspective rules were followed more rigorously. Attention also needs to be given to the correct proportions of the rooms being drawn.

The candidates fared worse in section 'A', garnering an average of 25/48 marks. The topics in this section require much more study and practice. The candidates are expected to have covered the whole syllabus throughout their two-year course, however, topics covered early on would be forgotten unless continuously revised and practiced. The examiners have noted various instances where candidates could not proceed with their solutions due to some missed steps.

The candidates fared worst in section 'B', garnering a very low average of 8/24 marks. Candidates studying for this section need to acquire a sound knowledge of engineering drawing regulations and conventions. Ideally, the candidates need to be introduced with this discipline from the beginning of their course so that the learning will be deeply embedded and retained. The examiners have noted that about 20% of the candidates did not even attempt any of the two engineering drawing questions presented. There were other candidates who merely drew a few initial lines and abandoned the solution. Only a few candidates presented commendable answers. Evidently, the candidates need to spend more hours of practice to get a deeper knowledge in the field of mechanical assembly drawings, incrementally and throughout their course of study. Working out multiple past papers and getting feedback helps candidates improve their technical knowledge and increase their efficiency. Moreover, drawing aids such as circle templates and drop-bow compasses help candidates speed up their solutions.

C. COMMENTS ON PAPER

Section A. Candidates had to answer FOUR questions from this section.

Question 1. Non-Concurrent Forces (13 marks)

The candidates were given the space diagram of a square-sectioned pillar with 5 coplanar non-concurrent forces acting on it. The candidates were asked to copy the space diagram according to the recommended scale. They were also asked to draw the force diagram, to a given scale, to determine the magnitude, angle and sense of the equilibrant. Finally, they were asked to draw a polar diagram to determine the location of the equilibrant force in the space diagram and measure the shortest distance of the equilibrant from corner A.

Six candidates managed to attain full marks in this question. The average mark was 7/13. The following is a list of shortcomings that led to loss of marks:

- A few candidates copied the given diagram without proceeding any further.
- Some candidates tried to solve the problem without applying Bow's notation.
- Other candidates found the resultant instead of the equilibrant.
- Others found the equilibrant but did not indicate the sense by means of an arrow.
- Some did not state the magnitude of the equilibrant.
- Most of the candidates who attempted this question drew only the force diagram thus only finding the magnitude and sense of the equilibrant. It appears that most of them either completely forgot how to draw the polar diagram or were not certain how to proceed and got confused midway. This hitch led to a considerable number of candidates losing significant marks.
- Some candidates mistakenly drew a 'parallel forces' load line and a polar diagram.
- Only a few candidates realised that the shortest distance to corner A had to occur at right angle to the line of action of the equilibrant (perpendicular distance).

1 to 6	7 to 9	10 to 12	Full marks	Not attempted
17	20	8	6	31

Question 2. Transition piece / triangulation (13 marks)

An illustration and two orthographic views of an oval-flat to hexagon transition piece were given. The candidates were asked to copy the given views, triangulate the surface of the piece, find the necessary true lengths and finally construct a half-surface development by using the triangulation method. Fifty-four candidates attempted this question. The average mark was 7/13. Six candidates attained full marks while others lost marks for the following reasons:

- Some candidates copied the given drawings incorrectly.
- Other candidates just copied the given drawings and did not continue any further.
- Some candidates did not triangulate the surface of the transition and consequently, these candidates did not construct the required true lengths. Some of these candidates tried, unsuccessfully, to proceed with the surface development.
- Only a few candidates labelled the triangulation points in the orthographic views and the development correctly. Labelling is the key to manage these questions successfully.
- Some candidates misinterpreted the question and treated the transition piece as a cone.

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- A few candidates divided the circular part of the transition piece into a small number of divisions thus leading to less accuracy.
- Quite a few candidates constructed only a small portion of the surface development.

1 to 6	7 to 9	10 to 12	Full marks	Not attempted
23	16	9	6	28

Question 3. Isometric drawing using isometric scale (13 marks)

The candidates were given two orthographic views of a plastic component. The candidates were asked to draw an isometric view of the object, using the isometric scale. This was the most chosen question and the average mark was 5/13. None of the candidates attained full marks although there were a few who were very close. The main reasons which resulted in loss of marks were the following:

- A number of candidates just copied the given views.
- 39% of the candidates attempted this question without constructing the isometric scale.
- Other candidates constructed an improper scale.
- Some candidates did not orientate the drawing properly, placing corner 'X' incorrectly.
- Others drew a planometric solution instead of isometric.
- Most candidates faltered when constructing the isometric circles, especially the circular part which was sloping. Ideally, to tackle this problem, the candidates had to draw partial orthographic views in iso-measurements. Ultimately, they would measure and transfer the co-ordinates of each point from the orthographic to the isometric.
- Others confused some measurements between the isometric dimensions and the real dimensions.

1 to 6	7 to 9	10 to 12	Full marks	Not attempted
41	23	3	-	15

Question 4. Intersection between cone and pentagonal prism (13 marks)

The candidates were given an illustration of a ceiling reflector consisting of a right cone interpenetrated obliquely by a pentagonal prism. A front elevation and an auxiliary plan were also given. The candidates were asked to copy the given views, construct the curves of intersection and complete the plan.

Fifty candidates attempted this question, and the average mark was 5/13. Two candidates attained full marks. The following are the main flaws manifested by the other candidates:

- More than half of the candidates who attempted this question simply copied the given views.
- Others did not copy the views correctly, but drew the base of the auxiliary cone freehand without any construction or with a compass arc from a random point, just to make it look like the given auxiliary view.
- Other candidates changed the intersection angle from 30° to some other random angle.
- Only a few candidates were meticulous enough to label the points and the generators.
- Some candidates opted to use 30° and the 60° generators of the cone rather than use the ones imposed by the pentagon vertices to locate the intersecting points.

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- Some candidates managed to construct the curve of intersection in the front elevation but found difficulty to transfer intersecting points from the front to the plan.
- Only a few candidates were aware that when a pyramid / cone is intersected by a prism at an angle other than 90° , an auxiliary view is required to locate the intersecting points.

1 to 6	7 to 9	10 to 12	Full marks	Not attempted
42	4	2	2	32

Question 5. Conic Sections (13 marks)

The candidates were given an illustration of a satellite communication poster. The main elements of this poster consisted of two conic sections namely a parabola and an ellipse. The candidates were asked to copy the given starting lines, construct a parabola in a rectangle, and locate its focus and directrix. They were also asked to locate the vertex of the ellipse, given its ratio of eccentricity. Finally, they were asked to plot the ellipse using the locus of a point method and finish off the poster.

Fifty-four candidates attempted this question. Two candidates attained full marks. The average mark was 7/13. The following is a list of errors which made candidates lose marks:

- Some candidates did not copy the starting lines correctly.
- Quite a few candidates did not know how to construct a parabola in a rectangle.
- Others confused it with the ellipse in a rectangle method.
- Only a few candidates could locate the focus and directrix of the parabola.
- Only a few candidates determined the location of the vertex by using the division of a line method.
- Some confused or swapped the distances ' pf ' and ' pd '.
- Others drew an incorrect eccentricity line or an eccentricity line at 45° , obviously resulting in an incorrect solution.
- Some candidates tried to draw an ellipse by using the auxiliary circles method.
- Others constructed half the ellipse correctly and reflected the other half without knowing the position of the minor axis.
- A few candidates drew an excessive number of lines perpendicular to the transverse axis to locate points on the ellipse. While there is nothing wrong with this, the candidates were most probably not very time efficient.

1 to 6	7 to 9	10 to 12	Full marks	Not attempted
27	12	13	2	28

Section B. Candidates had to answer ONE question from this section.

Question 6. Plummer Block (24 marks)

The candidates were given a balloon referenced exploded illustration of a plumber block. Detail drawings were given in a separate A3 sheet. The candidates were asked to draw a half-sectional elevation of the assembled plumber block. They were also asked to draw the assembled plan and include the cutting plane X-X. Forty-eight candidates attempted this question. No candidate attained full marks. The highest mark was 20/24 and the average mark was 8/24. Only a few candidates have shown a grasp of the engineering drawing concepts involved.

The following are the main reasons why most candidates lost marks:

- Most of the candidates tackled the sectional front and the plan separately. These should have been developed together with the measurements being projected from top to bottom and vice versa. In fact, most solutions consisted of a partially finished half-sectioned front elevation. The plan, in a number of cases, was omitted. This could have been easily projected from the top view. In these cases, 10 valuable marks were lost.
- Attention to detail and engineering drawing regulations (especially sectioning) was generally lacking.
- Other shortcomings include not drawing the bolts, sectioning of washers, disregard of the threading conventions, missing or incorrect oiling hole, not half sectioning the shaft, drawing the cap touching the base with no space in between them, no brasses and no shaft in the plan, omitting the section lines and not drawing the top cap.
- Other notable mistakes consisted in sectioning the whole front view, sectioning the whole drawing with no distinction between the different parts, incorrect assemblies, missing parts, parts drawn freehand, front elevation not sectioned, drawing half or three quarters of the plan, drawing half the sectional front and omitting the other half (outside view), incorrect projection angle and drawing an unrequested pictorial drawing of the assembly rather than an orthographic projection.
- Some candidates drew the plan alongside the front elevation instead of underneath it, showing that they lack basic orthographic positioning.

1 to 8	9 to 16	17 to 23	Full marks	Not attempted
29	18	1	-	34

Question 7. Turnbuckle Assembly (24 marks)

The candidates were given an exploded balloon referenced illustration of a turnbuckle. The assembly consisted of fewer parts than the previous question. However, the candidates had to be aware of some engineering drawing conventions such as revolved section and removed section. The candidates were also expected to have a basic idea how to draw a freehand sketch of two turns of a left-hand thread.

The turnbuckle consisted mainly of a main body with two threaded holes, one at each end. A hook end had a right-hand thread while the jaw end had a left-hand thread. The jaw end was fitted with a bolt and nut. The candidates were asked to draw the plan, a sectional front elevation, and a freehand detail of the indicated thread.

Seventeen candidates attempted this question. The highest mark was 17/24 and the average mark was 8/24. A few candidates did a good effort however, others lost marks for the following reasons:

- incorrect drawing of the main body;
- incorrect sectioning;
- lack of knowledge of the conventions regarding the representation of screw threads;
- lack of realisation that screw threads should not be sectioned when cut along their axis;
- omitting parts;
- incorrect drawing of the jaw end;
- drawing half a plan instead of a full plan;
- no candidate attempted to sketch the detail of a left-hand thread.

1 to 8	9 to 16	17 to 23	Full marks	Not attempted
11	5	1	-	65

Section C. Candidates had to answer ONE questions from this section.

Question 8: Burger Bash (Pictorial Chart) (24 marks)

This question assessed candidates' proficiency in organizational skills, critical thinking, design abilities, visual communication, presentation skills, problem-solving, attention to detail, and data interpretation. Candidates were tasked with creating a chart for a burger day to be exhibited in a school corridor. As part of their preparation, candidates had to produce two annotated preparatory sketches outlining their evolving concepts for the chart's layout. The chart also required a prominent "Burger Bash" title. Additionally, candidates had to illustrate eight sequential given steps for making a burger and creating a pictorial pie chart based on provided nutritional information. Thirteen candidates attempted this question. The highest mark was 22/24 and the average mark was 14/24. The following are the weaknesses which led to loss of marks.

- The two annotated preparatory sketches, intended to illustrate the candidates' developing ideas regarding the layout and presentation of the chart, were generally poorly executed.
- For the poster heading, most candidates did not use an appropriate typography.
- Some pictorial illustrations meant to depict the given steps were difficult to understand. The most challenging steps to interpret included adding ketchup to the bottom half of the bun, placing a crisp lettuce leaf, slicing a fresh tomato, and seasoning the patty with salt and pepper.
- A considerable proportion of candidates who opted for this question encountered difficulties in translating the nutritional data from percentages to degrees—a crucial step for constructing the pie chart. Difficulties were noted to adequately label the pie chart sectors, either through a legend or color-coding, and in devising a fitting title that conveyed the chart's content
- Others did not use colour and shading to render the chart.

1 to 8	9 to 16	17 to 23	Full marks	Not attempted
2	6	5	-	69

Question 9: Patio dining area (two-point perspective) (24 marks)

In this question, candidates were provided with a pictorial drawing, a third-angle orthographic projection and a suggested layout for a two-point perspective of a small patio dining area. This area included two identical wooden benches, a wooden cross-legged table and a shelf service window. Candidates were required to project an estimated two-point perspective of the area, with the viewing direction specified by an arrow on the orthographic projection plan. Additionally, they were asked to partially render their perspective to illustrate the colour and texture of the main elements in the outdoor dining area

Sixty candidates chose this question, and many performed quite well. The highest mark was 23/24 and the average mark was 14/24. Nevertheless, candidates lost marks due to the following shortcomings:

- Some candidates failed to construct the correct foreshortening. While most used the midpoint method, a number of candidates made errors in its application. Apart from drawing the perspective grid to represent the floor area, candidates are to ensure that the room three-dimensional proportions are correctly represented.
- The most common issue was determining the height of the wooden benches and the wooden cross-legged table within the patio area, resulting in a significant number of candidates losing marks in this part.
- Certain candidates did not render their perspectives, and the few who did, rendered untidily, thereby compromising the underlying line drawing.

1 to 8	9 to 16	17 to 23	Full marks	Not attempted
13	15	32	-	22

Chairperson
Examination Panel 2024