L-Università ta' Malta

MATSEC
Examinations Board

Examiners' Report

SEC Graphical Communication

Main Session 2021

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A. STATISTICAL INFORMATION

The total number of candidates who registered to sit for Graphical Communication was **444**. Of these registrations, **324** opted for Paper IIA and **120** opted for Paper IIB.

Table 1 shows the distribution of grades for the Main 2021 session of the examination

GRADE	1	2	3	4	5	6	7	U	ABS	TOTAL
PAPER A	26	53	60	37	50	-	-	81	17	324
PAPER B	-	-	-	15	11	10	8	45	31	120
TOTAL	26	53	60	52	61	10	8	126	48	444
% OF TOTAL	5.9	11.9	13.5	11.7	13.7	2.3	1.8	28.4	10.8	100.0

Table 1: Distribution of grades for Graphical Communication 2021, Main Session

B. GENERAL REMARKS

Fifty-six percent of the candidates who sat for the Graphical Communication exam achieved a grade of between 1 and 5. Four percent attained a grade of between 6 and 7, while twenty eight percent failed this examination. Eleven percent of the candidates who registered for SEC Graphical Communication were absent.

C. COMMENTS ON PAPER I AND PAPER II

Paper I

Paper 1 consisted of six questions, which covered the following topics (including the average attainment relative to the total marks):

1. Plane geometry (72.6%);
2. Inscribed and circumscribed circles (50.2%);
3. Circles in contact / ellipse (55.7%);
4. Sectional machine drawing and dimensioning (50.6%);
5. Surface developments (38.5%);
6. Two-point perspective (38.5%).

Ranked in order of difficulty, the average marks attained in questions 1 and 3 were at 73% and 56% respectively. This indicates that in the plane geometry and the circles in contact questions candidates fared moderately well. The attainment in questions 2 and 4 was around the 50% mark, thus candidates fared average in these two topics – inscribed & circumscribed and sectional drawings. In the last two questions, that of surface developments and the two-point perspective drawings candidates fared badly, below 40% of the average attainment relative to the total marks. The perspective result is not within the trend, as usually candidates fare relatively well in this question. It is suggested that these two topics are given their due importance, particularly with the accuracy and neatness aspects.

Question No.1 – Plane geometry (10 marks)

In this question, the candidates were given a tile like symmetrical design, which had to be replicated by means of geometric constructions. A square, divided into four smaller squares by means of centrelines was given. The candidates were asked to construct a grid in one of the smaller squares and copy one quarter of the design by joining the appropriate points on the grid. The candidates were finally asked to complete the whole tile pattern by reflecting along the vertical and horizontal symmetry lines.

Most of the candidates managed to attain a good mark. However, some candidates lost marks for the following reasons:

- The small square was divided in seven equal parts by mathematical calculations instead of using the set square method;
- The square was divided into an incorrect number of grid lines;
- Work was not done accurately and uneven grid lines were produced;
- The design was not copied and reflected correctly;
- The larger square was divided into seven equal grids and the quarter of the design was drawn on the whole tile – evidently, the whole design could not be completed;
- The design was just copied freehand without using any constructions.

	0	1 - 4	5 - 9	Full marks	Abs	Total
Option A	15	26	100	165	18	324
Option B	15	27	27	19	32	120

Table 2: the performance of the candidates in question 1.

Question No.2 – Inscribed and circumscribed circles (12 marks)

The question consisted of the profile of an advertisement flag and carried 12 marks. To complete the question successfully the candidates had to:

a. Inscribe a circle in a given triangle 'ABC'

b. Circumscribe a circle to a given triangle 'DEF'

c. Outline the profile of the design as given to them in the question.

Although most of the candidates attempted this question, not everyone knew the basics to inscribing or circumscribing a circle to a triangle. Some tried to find the centre of the circle by trial and error, which resulted in loss of marks.

The most common mistake by the candidates was using the wrong method to what was being asked of them. Therefore, inscribing a circle when they were asked to circumscribe it and vice versa.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	14	126	102	64	18	324
Option B	5	72	9	2	32	120

Table3: the performance of the candidates in question 2.

Question No. 3 – Circles in contact / ellipse (20 marks)

The question consisted of the profile of a toy dinosaur whose lower body was made up of a semi-ellipse while the rest needed to be constructed using tangential arcs and carried 20 marks. Almost all candidates attempted this question with only a few leaving it completely out.

Ellipse:

The most common method used by the candidates to answer this question was the concentric circles method, which they used with fairly good success. Most managed to construct the semi-ellipse to the given dimensions. The smooth freehand drawing of the elliptical curve was also drawn fairly well.

Tangential Arcs:

Although most candidates attempted this question, many found difficulties when attempting to locate the centre of the arc by construction. The most common mistake was adding or subtracting the wrong radii. However, some candidates tried to locate the centre of the required circles by trial and error and then faking the construction afterwards, which resulted in no marks being awarded. It was apparent that in some instances candidates did not read the question at all since some circles whose centre and radius was given were not drawn at all.

	0	1 - 10	11 - 19	Full marks	Abs	Total
Option A	3	113	161	29	18	324
Option B	5	69	14	0	32	120

Table 4: the performance of the candidates in question 3.

Question No. 4 – Sectional machine drawing and dimensioning – (20 marks)

This question tested the candidates' understanding of the principle of orthographic projection, their knowledge about sectional regulations and dimensioning. Candidates were given the plan and the profile of the front elevation of two assembled cast support brackets. An exploded pictorial drawing of the two cast support brackets was also given. The candidates were asked to complete the sectional front elevation of the assembled cast support brackets on cutting plane A – A. They were also asked to insert two radial and two linear dimensions on the orthographic views. Additionally, the candidates had to show all centre lines, omitting hidden details.

The following mistakes are worth noting:

- A good number of candidates did not know that, when two adjacent parts of the assembly are sectioned, the section lines are drawn in opposite directions. Ideally, lines are staggered where the parts are in contact.
- Some candidates hatched the middle web and the two side ribs even though it was 'cut' longitudinally. BS 8888 clearly states that a web / rib is not sectioned even if it lies in a given cutting plane, that is, if it is 'cut' longitudinally.
- A good number of candidates did not draw centre lines, which should have also been drawn behind the hatching lines to indicate hidden holes.

Nevertheless, the main difficulty was dimensioning. Many candidates either skipped inserting the two radial and the two linear dimensions or failed inserting the dimensions correctly. We would like to point some guidelines on correct dimensioning:

1. Extension lines and dimension lines are thin and continuous, thus without a middle gap.
2. On engineering drawings, arrowheads should be sharp, black, and filled in.
3. Small gaps are left between the extension lines and the orthographic drawing.
4. Extension lines project slightly beyond the dimension line.
5. Where possible, dimension lines should be located outside the drawing.
6. The measurement in millimetres is always placed above and not touching the dimension line.
7. Vertical dimensions are always viewed from the right-hand side of the drawing.
8. The symbol R is placed before a radius and the symbol ∅ is placed before a diameter.

	0	1 - 10	11 - 19	Full marks	Abs	Total
Option A	11	111	178	6	18	324
Option B	18	57	13	0	32	120

Table 5: the performance of the candidates in question 4.

Question No. 5 – Surface developments (18 marks)

This question tested the candidates on knowledge how to apply the principles of surface development. The surface development and an incomplete first angle orthographic projection of a truncated cone were given. By construction, the candidates had to complete the truncation on the front elevation, the truncation on the plan and the truncation on the end elevation.

Many candidates did not transfer the true lengths from the surface development to the sides of the front elevation or the sides of the end elevation. In fact, many candidates transferred the true lengths from the surface development to their corresponding radial lines on the front elevation or end elevation. A reasonable number of candidates also transferred these true lengths to mismatched radial lines on the front elevation or end elevation. The candidates could have used numbering on the surface development and on the orthographic projection and this would have helped them work this question better. There was also a good number of candidates that, after completing the front elevation or end elevation, did not manage to transfer the cut on the other elevations.

	0	1 - 10	11 - 17	Full marks	Abs	Total
Option A	13	181	94	18	18	324
Option B	32	52	4	0	32	120

Table 6: the performance of the candidates in question 5.

Question No.6 – Two-point perspective drawing (20 marks).

In this question, the candidates were given three dimensioned orthographic views and an isometric drawing of an indoor playground equipment. The equipment consisted of steps, a slope, a tunnel, and a set of battlements. They were asked to produce a two-point perspective drawing of the equipment.

A small percentage of the candidates managed to attain full marks in this question. Others attained a decent mark while a considerable number only managed to attain a few marks. The following is a list of shortcomings that were noted:

- A good number of candidates misunderstood the question and drew an isometric view. Some even complained, by means of a note, that they did not have enough space to complete their drawing.
- Other candidates did not foreshorten the sides of the object. This resulted in a badly proportioned drawing.
- A few candidates foreshortened the sides but did not foreshorten the heights.
- Certain candidates started the foreshortening method correctly but did not complete the subsequent steps. This indicates lack of practice.
- Some carried out a correct perspective drawing but scaled down the measurements by 50%.
- A good number of candidates drew the battlements incorrectly and in a disoriented manner.

	0	1 -10	11 - 19	Full marks	Abs	Total
Option A	12	177	101	16	18	324
Option B	10	69	8	1	32	120

Table 7: the performance of the candidates in question 6.

Paper II

Question No. 1 - Computer Graphics (12 marks)

In both papers question 1 dealt with computer graphics, where a series of data was given, and candidates had to plot these on a given grid. They also had to follow an ACI number so that plotted lines had to be coloured accordingly. The following are the examiners' observations with regard to candidates' shortcomings when dealing with this question.

In Paper A, marks were lost mainly due to:

- Errors when plotting data;
- Failing to plot certain data;
- Lack of neatness with colour;
- Swapping the x and y axes;
- Swapping aci colours;
- Failing to use colour.

In Paper B, marks were lost mainly due to:

- The question being left out completely;
- Errors when plotting data;
- Swapping the x and y axes;
- Filling the entire plotted drawing with colour;
- Lack of neatness with colour.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	21	28	175	83	17	324
Option B	16	15	46	7	36	120

Table 8: the performance of the candidates in question 1.

Question No. 2 – Pictograms and graphs (14 marks)

In both papers question 2 dealt with drawing ideograms and reading/plotting graphs according to data. The following are the examiners' remarks regarding the candidates' shortcomings when answering this question.

In Paper A, marks were lost mainly due to:

- Drawing microphones instead of mice (one candidate even drew an actual mouse);
- Drawing radios and hi-fi equipment instead of speakers;
- Drawing desktop towers instead of speakers;
- Failing to plot the graphs correctly according to given data;
- Lack of neatness when applying colour on bars/legend;
- Failing to colour the boxes in the legend section;
- Failing to read the data correctly from the graph and listing the wrong answer in the profit column;
- Failing to comply with the conventional representation of general information signs, (the majority left these signs in pencil whilst others used colours on these signs);
- Failing to differentiate between the representation of sketches and final ideograms, presenting the latter below an acceptable standard.

In Paper B, marks were lost mainly due to:

- Listing only one entry in the profit column;
- Drawing radios and hi-fi equipment instead of speakers;
- Drawing desktop towers instead of speakers;
- Failing to comply with the conventional representation of general information signs, (the majority left these signs in pencil whilst others used colours on these signs);
- Bars aligned with the back of the scale instead of the front;
- Lack of neatness when applying colour on bars/legend;
- Failing to apply any colour at all.

	0	1 - 6	7 -13	Full marks	Abs	Total
Option A	5	13	284	5	17	324
Option B	0	4	76	4	36	120

Table 9: the performance of the candidates in question 2.

Question No. 3 – Involutes (15 marks)

The paper A question was about involutes. It involved the construction of a square and triangle involute and part circle. Most of the candidates understood what was required to do, however there were some observations worth noting. A good number of candidates left out the radials to plot a good involute while others tried a freehand solution. Many candidates did not even attempt the involute of the circle. Most of the mistakes were common, by not projecting the perpendicular normal, thus made it more difficult to create a proper profile. With reference to the rendering part, many coloured the elevation instead of the pictorial drawing. It was also observed that overall, the rendering was quite basic many times just involving one colour and same shades. The solutions presented indicated a general lack of understanding of the locus of a circle and the necessity of more exposition to colouring and rendering.

In paper B, the candidates were asked to construct the involute of the square and triangle and render the given pictorial. Many candidates confused the answer, with many opting to sketch a freehand. Many candidates left out the radials extending for each side of the shape. The rendering part was omitted in many solutions. Candidates need to study and practise all parts and aspects of the syllabus especially rendering skills.

	0	1 - 7	8 - 14	Full marks	Abs	Total
Option A	41	92	171	3	17	324
Option B	24	36	24	0	36	120

Table 10: the performance of the candidates in question 3.

Question No. 4 – Locus of mechanism (12 marks)

This question what about locus of mechanism. The drawing presented in the question showing the toy with all the components should have helped the candidate. Only few managed to present a correct solution. There were many confusing answers. Some candidates considered point C as a slider while others considered point P and C as swivel. Only a few did an arc from C. A good number of candidates did not even include link DC in the construction. As a conclusion, it shows that candidates find loci of mechanisms confusing and need more training in this topic. It must be pointed out that only a few presented a decent presentation when it comes to construction and outline. Many answers where carelessly presented. It is imperative that graphical candidates know how to present good quality drawings.

In paper B, candidates where presented with a mechanism and asked to plot the locus of point P. The majority of the candidates left this question out, only opting to dividing both circles into 12. Many thought of point P as a swivel, or pivot, while others tried to construct a cycloid. This indicates a lack of preparation. Many solutions presented lacked basic presentation techniques. Practising using hands-on examples is very important. Understanding of moving parts (relative to one another) and identification of the difference between crank, linkage and pin joint should be atteded to.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	49	177	34	47	17	324
Option B	47	28	5	4	36	120

Table 11: the performance of the candidates in question 4.

Question No. 5 – Isometric / cabinet oblique (14 marks)

This question was about pictorial drawings, where candidates were asked to draw a freehand sketch and an isometric drawing. Another tested skill was that candidates had to create the isometric from orthographic. It should be noted that the majority of candidates could produce a proper isometric drawing, but most find it difficult to transfer from orthographic to pictorial. Candidates need to be more prepared in reading and understanding orthographic and in the knowledge of 1st and 3rd angle. It was noticed that several candidates rotated the drawing, showing confusion in elevation and lowest point. Candidates either did not notice or do not have the proper knowledge of the lowest point. With reference to the slope, very few candidates constructed the slope. When it comes to the circle, overall, many did the proper construction. When it comes to extending the curve part to the base, many failed to do a proper construction and finishing. It was also pointed out that a good number of candidates answered the isometric in freehand as well. This shows lack of reading the question properly. The question involved extensive knowledge in isometric, including slopes and curved parts.

In paper B, candidates were presented with 2 orthographic views. A pictorial freehand sketch and a measured cabinet oblique drawing was requested. Most freehand drawings were of poor quality. Many candidates are not prepared enough to visualize properly from orthographic to pictorial. With reference to the cabinet oblique drawing, the majority of candidates constructed the front façade part correctly but only a few managed the 45° sloping side properly. The semi-circle and its depth proved difficult for most candidates to draw as well. Training to visualize solid objects and the ability to transfer the clues in orthographic projection into pictorial drawings should be given its due importance.

	0	1 - 6	7 - 13	Full marks	Abs	Total
Option A	11	122	169	5	17	324
Option B	16	29	39	0	36	120

Table 12: the performance of the candidates in question 5.

Question No. 6 – Assembly (18 marks)

Many candidates attempted this question, especially in paper 2A, but there was a good number of candidates who partially answered it only. Of particular interest is the fact that in both paper A and B many candidates completely left out the hidden details. Others drew only some of the hidden detail omitting some obvious lines. It was also noted that the candidates drew the chassis in such a way that the driver has been placed in the centre, at 65mm from each edge. Much of the work was also very untidy, drawn with darker pencils than appropriate and thick blunt tips.

	0	1 – 10	11 - 17	Full marks	Abs	Total
Option A	59	140	107	1	17	324
Option B	16	42	26	0	36	120

Table 13: the performance of the candidates in question 6.

Question No. 7 – Intersection of solids (15 marks)

There was a lot to note in this question. Due to the way the views were placed, many candidates have drawn the 45° reflector in the wrong position. Some have even drawn it slanting in the opposite direction which in the case of this particular question (because it is symmetrical) it still produces the correct answer, but it is nevertheless very inappropriate practice. Many candidates did not bother with fold lines, and some candidates have drawn dotted lines instead. Added to this, there were another number of mistakes that indicated that most candidates did not really understand the concept behind the exercise involved, but were drawing from memory, trying to replicate what they learned in class through rote learning. Examples of these mistakes include drawing projection lines from the plan towards the development, not drawing in-between lines and in paper 2A joining the line of intersection to the corner of the given profile. Some candidates even drew the intersection line going upwards on the upper side of the speaker, as this is the way most questions are presented in class, even if it is very clear that the intersection is only happening at the bottom.

	0	1 – 7	8 - 14	Full marks	Abs	Total
Option A	36	195	72	4	17	324
Option B	18	64	2	0	36	120

Table 14: the performance of the candidates in question 7.

Chairperson
Examiners' Panel 2021