L-Università ta' Malta

MATSEC
Examinations Board

Examiners' Report

SEC Graphical Communication

Special September Session 2020

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A. STATISTICAL INFORMATION

Table 1 below shows the distribution of grades for the Special September Session 2020.

Grade	1	2	3	4	5	6	7	U	Abs	Total
Paper A	6	10	14	6	8	-	-	6	14	64
Paper B	-	-	-	4	2	2	3	13	10	34
Total	6	10	14	10	10	2	3	19	24	98
% of Total	6.1	10.2	14.3	10.2	10.2	2.0	3.1	19.4	24.5	100

Table 1: Distribution of grades for SEC Graphical Communication, Special September Session 2020

B. GENERAL REMARKS

Comments on Paper 1 and Paper 2

Fifty-one percent of the candidates who sat for the Graphical Communication exam achieved a grade between 1 and 5. Five percent attained a grade between 6 and 7, while nineteen percent failed this examination. A sharp increase of absentees over previous years was also noticed – over twenty-four percent of the candidates.

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 (87.5%);
2. cabinet oblique projection (66%);
3. circles in contact / tangential lines / ellipse (58.6%);
4. sectional machine drawing and dimensioning (45.9%);
5. surface developments (50.5%);
6. one and two-point perspective (48.2%).

Ranked in order of difficulty, the average marks attained in questions 1, 2 and 3 were above 58%. The average attainment in question 5 was 50.5% and that of question 6 was 48.2%. This indicates that in the plane geometry and the oblique questions candidates fared moderately well. The circles in contact/tangents/ellipse question is very popular amongst candidates and the two-point perspective question followed behind. Performance in question 4 was poor and many candidates omitted the part related to dimensions entirely.

Paper 2

Paper 2 consisted of seven questions, which covered the following topics (including the average attainment relative to the total marks):

1. computer graphics (73.5%);
2. cycloid and rendering (54.9%);

3. intersection of solids (40%);
4. graphic symbols and design (77.3%);
5. true lengths (36.9%);
6. assembly (54%);
7. auxiliary projection (49.4%).

The majority of candidates did well in question 4 about graphic symbols and designs, and also in question 1, with the average for both questions above the 73% mark. In the assembly (question 6) and cycloid and rendering (question 2), candidates scored at around 54%. One must note that the assembly question featured a parts list and a non-freehand solution for the second time. In question 7, 3 and 5 candidates attained an average mark below 50%, the lowest being 36.9%. Candidates' performance was poor in the questions involving auxiliary projection and intersection of solids. Candidates fared the worst in the true lengths.

The following is an overall general list of shortcomings noted by the markers:

- Lack of proper colouring and shading techniques;
- Lack of overall neatness; in some cases, very smudgy solutions were presented;
- Lack of knowledge of full features in some topics like cabinet oblique projection (ex. half-depth);
- Lack of dimensioning knowledge;
- Lack of knowledge of engineering standards and conventions;
- Lack of knowledge on true lengths and surface developments;
- General feeling that many candidates resort to crude trial and error methods to solve their questions;
- Lack of overall time management;
- Lack of differentiation between construction lines and outlines;
- Poor freehand sketching skills;
- Lack of accuracy in many solutions;
- Ample evidence that some candidates do not read the question properly and rush to start their solutions.

C. COMMENTS REGARDING THE CANDIDATES' PERFORMANCE

Paper 1

Question No. 1 – Plane geometry (12 marks)

Candidates were asked to follow the five stages listed below to construct a given tile design.

- shade in grayscale or colour, the tile design already given;
- using centre O, draw a circle R60 and construct a regular hexagon;
- using a geometrical method, divide base AB into 3 equal parts;
- draw the grid lines inside the hexagon parallel to the hexagon sides;
- draw the tile design on the grid.

Most candidates performed well in constructing a regular hexagon, dividing the base line into 3 equal parts using a geometrical method, drawing grid lines inside the hexagon parallel to the hexagonal sides and finishing the tile design. On the other hand, a good number of candidates showed poor shading skills. Some of these candidates did not even follow the grading scale from dark to light shown in the given tile, shading a completely different type of tile. A number of candidates used a clutch pencil to shade leaving lots of space in the shading. A well sharped HB pencil or coloured pencil colour would have been a better medium to apply constant pressure in this part. There were also candidates who shaded outside the outline.

Table 2 below shows the performance of the candidates in Question 1.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	-	-	20	30	14	64
Option B	-	5	16	3	10	34

Table 2: Candidates' performance in Question 1

Question No. 2 – Cabinet oblique projection (14 marks)

In this question, the candidates were tested for their knowledge in constructing a cabinet oblique projection from a given first angle orthographic projection of a child toy cube. The 80 mm child toy cube had three recesses in which a circle on the front face, a square on the side face and a triangle on the top face fit. All recesses were 10 mm deep. The cube also had a small chamfer.

A considerable number of candidates attempted this question successfully; however, marks were lost because of inaccurate crate dimensions. In cabinet oblique projections, the receding axes are drawn at a 45º to the horizontal, foreshortened to look more natural by one half. Many candidates did not reduce half full size the 45º lines, even when constructing the depth of circle on the front face, the square on the side face and the triangle on the top face. Also, most candidates did not construct the chamfer, implying that they did not fully understand the orthographic projection.

Table 3 below shows the performance of the candidates in Question 2.

	0	1 - 6	7 - 13	Full marks	Abs	Total
Option A	0	6	36	8	14	64
Option B	1	14	8	1	10	34

Table 3: Candidates' performance in Question 2

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

This question consisted of the profile of an anvil. On the left side the candidates had to construct a quarter of an ellipse, the lower part consisted of an arc whose centre was to be found using the 3-point circle methods while the right side of the anvil had to be constructed by tangential arcs.

In this question, candidates were examined on their handling of the compasses and drawing instruments, knowledge of ellipse and properties of circles and the overall neatness and accuracy of their work.

Quarter of an Ellipse – The candidates were given the start lines of a quarter of an ellipse. They had to use any approved method to draw the ellipse with a given major and minor axis. The greater majority of candidates opted to use the 'concentric circles' method and most managed to use the method correctly and to the given dimensions.

Common Mistakes – Ellipse

- Not using the given major and minor axis;
- Constructing the ellipse somewhere else (most instead of the 3-point circle);
- Freehand not smooth and dirty.

3-point circle – Candidates were given 3 points from an arc. They had to find the centre of the circle by geometrical construction and then complete the arc as required. Most Paper B candidates did not do this correctly. Instead, some drew an ellipse while others chose to not do any construction at all and instead located the centre of the arc by trial and error, which resulted in no marks being awarded.

Common Mistakes – 3-point circle

- Locating the centre by trial and error;
- Bisecting only one chord;
- Drawing an ellipse instead of using the 3-point circle method.

Tangential arcs – The candidates were given 2 centres (D and E) on which they were required to draw a circle of R32 and a circle of R10 respectively. Then they had to locate by construction the centres of 3 other tangential arcs, 2 of them with circles centre D and E and the other which was partly touching the ellipse. Almost all candidates attempted this part of the question with only a few leaving it completely blank. However, some candidates did not even draw the 2 circles on the given centres and with the given radius. Some candidates tried to locate the centres of the tangential arcs by trial and error or with no construction at all which resulted in no marks being awarded.

Common mistakes – Tangential Arcs

- Locating the centres by trial and error;
- Adding or subtracting the wrong radius, which resulted in a mistake when locating the centre of the required circle.

Table 4 below shows the performance of the candidates in Question 3.

	0	1 - 10	11 - 19	Full marks	Abs	Total
Option A	-	9	33	8	14	64
Option B	-	21	3	-	10	34

Table 4: Candidates' performance in Question 3

Question No. 4 – Sectional machine drawing and dimensioning (16 marks)

In this question, the candidates were given a pictorial view together with the complete plan and an incomplete sectional Front elevation in third angle projection. They were required to complete the Sectional Front and then add 2-linear dimensions and 2-radial dimensions.

Most of the candidates attempted this question with mixed results. Some attempted to draw the Front instead of the Sectional Front. Others tried to draw the Plan view instead of the sectional Front. The Sectional Front also had a countersunk hole which most of the candidates attempted to draw fairly well.

Quite a good number of candidates did not hatch their sectional front, which resulted in a good number of marks being lost. Others hatched all of it, including the ribs/webs and holes which resulted in marks being deducted.

When it came to adding the linear and the radial dimensions, the greater majority of candidates left this part completely out. Only a select few attempted this part of the question with some adding the dimensions to the given pictorial view instead of the Sectional Front as required.

Common mistakes

- Not hatching at all
- Hatching on the rib/webs
- Not including the centre lines
- Mixing up 3rd angle with 1st angle projection
- Not attempting the linear and radial dimensions at all.
- Trying to draw an un-sectioned front.

Table 5 below shows the performance of the candidates in Question 4.

	0	1 - 7	8 - 15	Full marks	Abs	Total
Option A	-	13	37	-	14	64
Option B	2	20	2	-	10	34

Table 5: Candidates' performance in Question 4

Question No. 5 – Surface developments (18 marks)

In this question, the candidates were given a plan, an incomplete front elevation, and an incomplete surface development of a cylindrical cardboard puppet. The candidates were expected to complete the surface development and the front elevation. They were also asked to shade two indicated areas.

Most Paper A candidates attempted this question, and the average mark was 10.6. A small number of candidates managed to attain full marks while others lost marks for the following reasons:

- A considerable number of candidates did not divide the circle circumference into twelve equal parts and just used the given centre lines to divide into just four equal parts. These candidates divided the development into four equal parts and projected lines from the front elevation. Obviously, this method gave very inaccurate results.
- Some candidates divided the circular plan into twelve equal parts but failed to label the divisions on the circle and on the development. This led to several misplaced plotting points in both the development and front elevation.
- A significant number of candidates drew the legs of the puppet straight instead of curved.
- Other candidates just drew estimated freehand curves without any projection or construction.
- Some candidates shaded their drawings in a very crude and insensitive manner.

Table 6 below shows the performance of the candidates in Question 5.

	0	1 - 10	11 - 17	Full marks	Abs	Total
Option A	2	22	19	7	14	64
Option B	-	20	3	1	10	34

Table 6: Candidates' performance in Question 5

Question No. 6 – Perspective drawing (20 marks)

The candidates were given three orthographic views and a pictorial illustration of the interior of an observation deck. They were also given the starting lines and the location of three vanishing points. The shape of the deck was rectangular with a semi-octagonal extension. The walls consisted of seven glazed panels, five of which followed the single-point perspective rules while the other two panels followed the two-point perspective rules.

All Paper A candidates attempted this question. The average mark was 12.1. Many candidates attained high marks. The following is a list of shortcomings committed by other candidates.

- Some candidates did not foreshorten the receding tiles and drew all tiles equal in depth. This made the room look extremely deep.
- Other candidates drew lines radiating from and to incorrect vanishing points.
- Most of the candidates who drew the tiles correctly managed to draw the base of the semi-octagonal part of the room by drawing diagonals across the affected tiles. However, only a few candidates managed to draw the top part of the semi-octagonal balcony completely correct. In the latter case, the candidates had to make use of the side vanishing points.

Prospective candidates are to be aware that when the room and its contents have a square or rectangular shape and the viewing direction is perpendicular with one side of the room and its contents, the single-point perspective rules apply. On the other hand, if parts of the room or its contents are not parallel to the square grid, then the two-point perspective rule applies.

Table 7 below shows the performance of the candidates in Question 6.

	0	1 -10	11 - 19	Full marks	Abs	Total
Option A	-	18	25	7	14	64
Option B	2	22	-	-	10	34

Table 7: Candidates' performance in Question 6

Paper 2

Question No. 1 – Computer Graphics (10 marks)

A high percentage of candidates who sat for paper 2A obtained high or full marks in this question. Many failed to hit the highest mark due to lack of precision and neatness, such as using unsharpened coloured pencils. Candidates who scored low marks in this question failed to reflect part or half of the image.

Regarding paper 2B, performance in computer graphics' questions was relatively poor. Some candidates plotted the image upside down, even though they rightly plotted the letters on the grid. Many candidates ignored the use of colour. Those who did use colour, lacked precision and neatness. There were only a small number of candidates who did draw a freehand version of the 4 tiles placed together. Those who attempted this part of the question used the four boxes together to draw one single tile, which in many cases was not the one according to data.

Table 8 below shows the performance of the candidates in Question 1.

	0	1 – 4	5 - 9	Full marks	Abs	Total
Option A	-	2	26	22	14	64
Option B	3	9	12	-	10	34

Table 8: Candidates' performance in Question 1

Question No. 2 – Cycloids and rendering (18 marks)

In the first part, were candidates had to continue the front wheel, the majority performed well. Many drew the cycloid well and organised points properly. On the other hand, a number of candidates lack basic skills since the freehand curve was drawn in parts. With regard to the scrolls, it shows lack of planning when candidates are left free with no starting point direction. A good number did the scrolls bigger or smaller than the given proportion. Moreover, only a few constructed a guide line with instruments before actually designing the scroll freehand. With reference to rendering, few candidates enhanced the curtains with appealing colours. When it comes to shading, only a handful did so neatly and correctly. In the last part, candidates had to render the wooden base and quite a good number of candidates rendered the wood effect correctly. However, colour was only done by a few. Overall response was good.

In paper 2B, some candidates did not centre all the spokes. With reference to the cycloid part, some candidates confused this topic with the helix. Only a few used the division of a line to divide the length of the circumference. Others missed the upper layer of the cycloid. Regarding the points, only few managed to

do them all correct. The freehand implementation of the cycloid curve shows that a good number of candidates drew the freehand by trial and error trying to mimic the curve shown in the question. Many managed to do a decent scroll design in freehand. However only few candidates did a plan and constructed lines where to place the scrolls. The rendering part indicated lack of colouring and ideas skills. Not a single candidate coloured the curtains, and only a few rendered the wood part.

Table 9 below shows the performance of the candidates in Question 2.

	0	1 - 10	11 -17	Full marks	Abs	Total
Option A	-	16	33	1	14	64
Option B	-	20	4	-	10	34

Table 9: Candidates' performance in Question 2

Question No. 3 – Intersection of solids (12 marks)

The intersection involved a pentagonal prism intersecting a semi-cylinder. Many candidates instead of focusing on the pentagonal prism to project the lines of intersection, focused on dividing the semi cylinder into 6, which is superfluous. With reference to the upper curve of intersection, many candidates managed to construct it and draw it freehand. Conversely, many missed the hidden part. In the pentagonal solid, only few candidates did all the hidden detail correctly and using the right line type. The responses presented for this question indicate that not all candidates grasp a good understanding of intersection of solids.

In paper 2B, this question featured the intersection of a triangular prism with a semi-circle. Unfortunately, only a few candidates managed to present a full solution. Many confused how to project the lines and where to find the points of intersection. Many candidates found it hard to include the hidden details as well as the freehand curve. A good number of candidates only projected the main lines without constructing extra points. This made it difficult to line in the curve of intersection. Many candidates even confused the views and the presentation of solids.

Table 10 below shows the performance of the candidates in Question 3.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	1	28	17	4	14	64
Option B	8	13	3	-	10	34

Table 10: Candidates' performance in Question 3

Question No. 4 – Pictograms (12 marks)

A high percentage of candidates sitting for paper 2A obtained high marks in this question. Some used words instead of a symbol to convey the message. Marks were lost due to poor sketching of ideas and failing to make good use of the space for the final symbol.

Regarding candidates who sat for paper 2B, many scored high marks, but only two candidates were able to obtain all marks. Marks were lost due to re-copying the exemplar given, both in the sketch and final-presentation area. Others lacked neatness in executing the final symbol, by drawing straight lines in freehand and by not shading the symbols as requested.

Table 11 below shows the performance of the candidates in Question 4.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	1	2	36	11	14	64
Option B	-	2	20	2	10	34

Table 21: Candidates' performance in Question 4

Question No. 5 – True lengths (12 marks)

This question proved to be quite challenging to candidates. It is imperative that the importance of proper and precise measurement is clearly understood. Despite certain true lengths were given, candidates wrongly measured and printed them incorrectly in the requested spaces. Many candidates attempting paper 2A found difficulty in finding true lengths by rotation. Some even failed in the process of transferring the given heights of arrows to the true shapes.

The great majority of candidates attempting paper 2B performed poorly in this question. Many failed to recognize the true lengths given, let alone use construction work to find those not given. Most candidates ignored the fact that they had to draw the true shape of the arrow, whilst many of those who did, just copied the one given.

Table 12 below shows the performance of the candidates in Question 5.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	3	25	21	1	14	64
Option B	11	12	1	-	10	34

Table 12: Candidates' performance in Question 5

Question No. 6 – Assembly (18 marks)

In this question, a good number of candidates presented incorrectly drawn octagons. A notable amount of candidates have also not drawn the inner lines denoting the prism and only drawn the base of the pyramid. Blades have mostly been drawn incorrectly with only a handful of completely correct ones. Most notably, some candidates have drawn the blades to the end of the centre line provided. Hidden detail was also missing in many of the papers.

In general, even though work was lacking in completeness, most candidates have been able to demonstrate that they are able to build a mental model of the assembled item.

Table 13 below shows the performance of the candidates in Question 6.

	0	1 – 10	11 - 17	Full marks	Abs	Total
Option A	1	20	28	1	14	64
Option B	1	14	9	-	10	34

Table 13: Candidates' performance in Question 6

Question No. 7 – Auxiliary Projection (18 marks)

Many candidates, both in paper 2A and 2B, either have left this question out or only barely started it. Some candidates have only drawn the outline of the furniture item, some of whom also done correctly. It was also notable that many candidates have drawn the solutions symmetrically denoting both a lack of spatial reasoning and the concept of using projection lines.

On a different note, most candidates who went ahead with the question were able to complete the part with the squares, which shows for a minimum, a basic understanding of projecting between views.

Table 14 below shows the performance of the candidates in Question 7.

	0	1 – 10	11 - 17	Full marks	Abs	Total
Option A	3	21	24	2	14	64
Option B	-	16	8	-	10	34

Table 14: Candidates' performance in Question 7

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