EXAMINERS' REPORT

SEC GRAPHICAL COMMUNICATION
MAIN SESSION 2018

L-Università
ta' Malta

Administration

Temporarily stapled A3 drawing sheets with printed questions and starter lines were presented to each candidate for both Paper 1 and Paper 2 (which consisted of six and five sheets respectively). The candidates were asked to remove the temporary staple, write their index number on each sheet and draw their solutions. At the end of the examination, the sheets were permanently stapled together and collected by the invigilators. The board wishes to thank the Examination Officers, invigilators and all those concerned for their dedicated work in carrying out this exercise. The board is satisfied that all the drawing papers were presented intact to the markers.

General Comment

Seventy six percent of the candidates who sat for the Graphical Communication attained a grade between 1 and 5. Eight percent attained a grade between 6 and 7 while sixteen percent failed their examination.

Paper 1 consisted of six questions which covered the following topics:

1. circles in contact / ellipse;
2. locus of mechanisms;
3. sectional machine drawing;
4. surface development of truncated pyramids;
5. planometric drawing;
6. single-point perspective.

The average mark attained in questions 1, 3, 5 and 6 was well above 50% while the average mark for questions 2 and 4 (in particular) was below 50% of the allocated marks. These two unpopular questions required the candidates to apply concepts learnt at school to real-life situations suggesting that more practical work needs to be done in class (such as physically cutting, folding surface developments and building simple mechanisms / linkages models) so that candidates truly understand the concepts during their practical drafting sessions.

Paper 2 consisted of seven questions which covered the following topics:

1. computer graphics;
2. vectors;
3. graphic symbols / graphical representation of data;
4. freehand sketching / assembly drawing;
5. helix;
6. interpenetrations / surface development;
7. auxiliary projection.

As usual, the most popular question was that of computer graphics. Candidates attained an average mark above 50% in all the questions, except in freehand sketching / assembly drawing. The board proposes that more freehand sketching practice is carried out in class, as this helps with the development of the candidates' spatial visualisation skills and fosters their creativity.

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

- Lack of either pencil control or proper pencils to differentiate between construction lines and outlines;
- Poor presentation especially when drawing freehand sketching;
- Lack of proper colouring and shading techniques;
- Not enough knowledge of engineering standards and conventions;

- Lack of visualisation skills;
- Inability to simplify graphic symbols;
- Lack of problem-solving skills;
- Colour filling-in the shapes in the computer graphics question;
- Lack of overall neatness with some candidates producing very smudgy solutions;
- General feeling that several candidates do not read the question thoroughly but instead rushed to produce a solution immediately.

Statistical Information

The table below shows the distribution of grades for the May 2018 session.

GRADE	1	2	3	4	5	6	7	U	ABS	TOTAL
PAPER A	27	56	67	64	62		-	41	1	318
PAPER B	-	-	-	12	27	16	15	27	11	108
TOTAL	27	56	67	76	89	16	15	68	12	426
% OF TOTAL	6.3	13.1	15.7	17.8	20.9	3.8	3.5	16.0	2.8	100.0

Comments regarding the candidates' performance

Paper 1

Question No.1 – Ellipse and Tangential Arcs (20 marks)

In this question, candidates were tested for their knowledge of Ellipse, Tangential Arcs (touching circles) and compass handling. Candidates were required to draw an inclined ellipse and then construct a tangent. They were also required to draw the profile of a quad bike, by drawing circles; from a given centre and radius, by locating the centre or deducing the radius by construction.

Ellipse: Most of the candidates attempted the question. A variety of construction methods were used with the preferred one being the concentric circles method. However, many did not locate the focal points successfully and therefore they could not construct the required tangent. Although the ellipse was meant to be constructed at 30°, some candidates drew a horizontal ellipse.

Common Mistakes – Ellipse

- Many tried to draw the tangent without any construction whatsoever;
- The freehand curve of the ellipse was not drawn smoothly which resulted in loss of marks.

Quad bike profile: Almost all candidates attempted to solve this part of the question with only a few leaving the solution completely blank. It should be noted that some candidates did not even draw the circles, whose centre and radius were given, indicating that some candidates did not read the question at all and skipped it entirely. Most candidates found the R35 tangential arc hard to solve. Only a few of the candidates knew how to locate the required points of tangency or knew how to use the given ones to help them locate the required centre of a circle.

Common Mistakes – Tangential Arcs

- When drawing the R35 circle, a considerable number of candidates tried to use the R10 circle instead of the R100 one;
- Most candidates could not locate the points of tangency with some opting instead to randomly draw small dashes;
- Drawing the circles without first locating the centre yielded no marks.

The table below shows the performance of the candidates regarding question 1.

	0	1 - 10	11 - 19	Full marks	Abs	Total
Option A	0	74	216	27	1	318
Option B	1	59	37	0	11	108

Question No.2 - Locus of Mechanism / Archimedean Spiral (12 marks)

In this question, candidates were required to draw the Locus of a Mechanism. The Mechanism had a slider which moved from 'A' to 'B' for the first half of a turn and for the second half it moved back to its starting position 'A'. Many candidates left this question out completely without attempting it. Others went out of point with some candidates drawing a helix or trying to develop a cone from the given start lines. It seems that many did not read the question at all or if they did, they did not understand what was being asked of them.

Common Mistakes:

- Drawing one whole turn of a spiral instead of the required locus of the point which was supposed to be heart shaped
- Using the centre of the slider as the centre of the mechanisms instead of the given centre, thus having the answer shifted upwards and inaccurate.

The table below shows the performance of the candidates regarding question 2.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	40	148	73	56	1	318
Option B	30	57	9	1	11	108

Question No. 3 - Sectional Orthographic view of a machine part (14 marks)

The majority of candidates attempted this question. This question tested the candidates' understanding of the principles of Orthographic projection and their knowledge about sectioning principles. Although most of the candidates did relatively well, others did not project from one view to the other correctly. This resulted in inaccuracies, especially with the webs and when drawing the 3 circles. Many omitted the centrelines and fillets. Another common mistake was hatching in multiple directions as if it was made up of multiple components. Others were unaware of the rule that a web/rib is not hatched when the cutting plane is along its axis and hatched when the cutting plane is across its axis.

Common Mistakes:

- Omitting drawing centrelines and fillets
- Drawing the view as a normal orthographic projection and not sectioned (some included the hidden detail of what was supposed to be the answer)
- Hatching everything (Web, base, through holes)
- Sectioning in multiple directions.

The table below shows the performance of the candidates regarding question 3.

	0	1 - 7	8 - 13	Full marks	Abs	Total
Option A	7	129	173	8	1	318
Option B	2	68	27	0	11	108

Question No. 4 - Solid Geometry/Surface Development – (16 marks)

This question tested the candidates' knowledge on how to apply the principles of surface development. Two orthographic views in first angle orthographic projection and a pictorial illustration of a lantern were given. The lantern was made up mainly of two truncated sheet metal pyramids, 'A' and 'B'. Starting lines were given and candidates were expected to construct the true length of the slant edges of pyramid 'A', the surface development of the truncated pyramid 'A', the true length of the slant edges of pyramid 'B' and the surface development of the truncated pyramid 'B'.

The following are a number of errors which were noted:

a) Some candidates did not construct correctly the true lengths of both pyramids, that is, neither of the slant edges of pyramid 'A' nor the slant edges of pyramid 'B'.
b) A considerable number of candidates did not construct correctly the surface development of pyramid 'A' and pyramid 'B'. Shortcomings were partly because of the mistaken true lengths of the slant edges of both pyramids but also on taking incorrectly the true lengths of the base of the pyramids.
c) Several candidates did not project on the true length of the slant edges of the pyramids the truncated parts of both pyramids. In fact, most candidates took the measurements of the truncated part of the pyramids directly from the orthographic views.
d) A good number of candidates did not draw folding lines.

The table below shows the performance of the candidates regarding question 4.

	0	1 - 7	8 - 15	Full marks	Abs	Total
Option A	85	146	76	10	1	318
Option B	43	48	5	1	11	108

Question No. 5 - Planometric view (18 marks)

This question tested the candidates' understanding of planometric views, and their spatial visualization ability. Three orthographic views with all necessary dimensions of a model garden deck, starting lines and one of the flower pots in 60º / 30º planometric view were given. Candidates were also given notes stating that in the orthographic views, the flower pots and the pond were 5mm deep, the material thickness of the garden shed was also 5mm and that an octagon 60mm A/F was to be constructed to locate the remaining flower pots. Candidates had to complete the garden deck in 60º / 30º planometric and render, using coloured pencils, the flower pots.

The following is a list of frequent errors which were noted:

a) Incorrect crate dimension or no crate at all.
b) Difficulty in visualising correctly the garden deck.
c) Difficulty in constructing an octagon 60mm A/F in 60º / 30º planometric view to locate the flower pots.
d) Difficulty in constructing the pond, in some cases candidates took ordinates or used the compass method to construct the circles for the pond, thus wasting time.
e) Some candidates drew the semi-circle for the window and door of the garden shed freehand without any construction.
f) Some candidates drew the semi-circle for the door of the garden shed using the 4-arcs method despite the fact that the door was on the 60º face of the planometric view.
g) Most candidates did not know how to artistically render the flower pots using coloured pencils to create shading and texture. In fact, most candidates applied a random colour to the flower pots.

The table below shows the performance of the candidates regarding question 5.

	0	1 - 10	11 - 17	Full marks	Abs	Total
Option A	7	97	196	17	1	318
Option B	7	53	36	1	11	108

Question No. 6 - Perspective drawing (20 marks)

In this last question for Paper 1, candidates were asked to draw an estimated well-proportioned one-point perspective view of a laundry room. Two detailed views in first angle projection (a front elevation & plan) and an isometric pictorial view were given. The vanishing point, the ceiling, the door and some starting tiles were also given. This question was presented on a sheet on its own and ample space was given to draw a good solution. The overall projection and placing of the furniture relied heavily on drawing properly the floor tiles. The viewing direction was very clearly shown twice.

Nearly everyone attempted the question even though this was the last one in the paper. This clearly shows that some candidates choose which questions to carry out first, according to their knowledge and difficulty perception. The furniture placing, and the overall proportions relied heavily on drawing the tiles properly, but this was the biggest shortcoming. Despite having four tiles given as part of the solution, most candidates divided the floor diagonally across all the tiles (12) in a mechanical fashion. Some then had 12 tiles instead of the required 6, so some candidates just skipped a diagonal marking to achieve the needed result. This proved to be a quick fix for most candidates who realised mid-way, but they still did not garner any marks for this part. Very few candidates marked correctly the 6th tile at the back end of the room and joined a diagonal to either front corners, which was the most straight forward technique. Some other candidates divided the side into 6 parts and then transferred the tile depths to the floor, which was a somewhat messy, more laborious but still an acceptable technique. A few candidates are still using the diagonal method to find the tile depths, but in this case, this was not acceptable since you can bisect the depth for 4 or 8 tiles, but not for 6.

The following are some further general observations worth noting:

- Frequent confusion of the heights, and not correctly projecting the heights from the front side transferring them inside the room.
- Some candidates missed the correct tiles and drew the laundry after the 6th tile, making it go further down the room behind the back wall.
- Some solutions looked more like a very deep hall rather than a small laundry room and it's not very clear why the candidates visualised it this way.
- Overall most of the candidates understood that the cupboards were behind the steps, and therefore were partially covered.
- Very few candidates did not even join the tiles to the V.P. meaning that, most probably, they missed the whole perspective concept.
- Evidence indicates that a number of candidates got low marks due to lack of time management, since many impeccable, albeit partial, solutions were given.

The table below shows the performance of the candidates regarding question 6.

	0	1 -10	11 - 19	Full marks	Abs	Total
Option A	6	128	180	3	1	318
Option B	5	60	32	0	11	108

Paper 2

Question No. 1 - Computer Graphics (10 marks)

Almost all candidates sitting for papers 2A and 2B attempted this question, with the majority obtaining most of the marks allocated. Marks were mainly deducted due to lack of neatness, with thick coloured lines being applied, often with the use of pens or crayons. The use of such media hindered those candidates who wished to erase mistakes, as it was impossible for them to rub off. In several of these cases smudges were left all over the solutions. Some candidates worsened this situation by filling the entire space between the lines with colour instead of applying it to the outlines only.

Very few candidates failed to obtain at least a minimum number of marks, with only a negligible few leaving the question out completely. Some candidates, especially those answering paper 2B, swapped the X and Y axis of the graph and drew part or the whole set of commands transversely. None of the said candidates then reflected the drawing as requested. There were also a small percentage of candidates, who although using the X and Y axis correctly, still didn't reflect the drawing.

All in all, the majority of candidates sitting for papers A and B, seem to have a correct understanding of the given commands and are able to execute these rightly in the allocated space.

The table below shows the performance of the candidates regarding question 1.

	0	1 - 4	5 - 9	Full marks	Abs	Total
Option A	7	12	217	81	1	318
Option B	15	21	45	16	11	108

Question No. 2 – Vector Diagram (10 marks)

For this question candidates where presented with a coplanar concurrent space diagram. It included four forces and the candidates had to find the resultant. Most candidates found the freehand sketch beneficial to plan the vector diagram. A number of candidates produced very poor freehand sketches, while others just copied the space diagram. With regards to drawing the vector diagram there was an overall good response. A good number of candidates didn't label the magnitude and only a few managed to apply the right direction to the resultant.

The table below shows the performance of the candidates regarding question 2.

	0	1 - 5	6 -9	Full marks	Abs	Total
Option A	23	40	206	48	1	318
Option B	43	13	39	2	11	108

Question No. 3 – Graphical Representation of Data (14 marks)

Strong evidence shows that most candidates in both papers 2A and 2B lack the appropriate understanding of drawing freehand preparatory sketches. Most of these sketches were haphazardly attempted, showing lack of developing ideas. The majority of candidates in paper 2A attempted only two sketches, one for each icon, and then copied the same sketches in the proper solution spaces. Very few candidates felt the need to develop their initial ideas by adding further sketches. Those following such path, showing the development of their thinking skills, were awarded the majority of marks for this part of the question.

Most final solutions were presented as mere freehand sketches and left in pencil without there being any difference between these and their preparatory counterparts. Very few candidates used instruments or black colour to enhance such signs. More than half the candidates also failed to properly colour code these signs according to the given key. Most of those who did use colour, applied it to the image's background instead of the borders given.

Most candidates sitting for paper 2B attempted only one preparatory sketch and didn't feel the need to develop this further. Most solutions were then drawn in freehand and were not well scaled to the available space. Many failed to outline these icons in black and the proper use of colour coding was also missing.

In both papers 2A and 2B, some candidates failed to neatly draw the line graphs, or did so without following the suggested line type or colour code. A number of candidates from both papers also failed to properly plot the line graphs or to read and transfer data from the graph to the given table.

Only a small number of candidates left this question completely unanswered.

The table below shows the performance of the candidates regarding question 3.

	0	1 - 6	7 - 13	Full marks	Abs	Total
Option A	3	40	272	2	1	318
Option B	4	26	67	0	11	108

Question No. 4 –Freehand Pictorial Assembly Drawing (15 marks)

Candidates answering paper 2A had to draw their solution in Isometric projection, whilst those answering paper 2B had to draw theirs in oblique projection.

Very few candidates answering either paper 2A or paper 2B were deemed capable of properly executing well-proportioned freehand drawings. It is clear from the attempted solutions that most candidates didn't approach the freehand drawing holistically, failing to proportion all parts of the given robot to a proper scale before any outlining was attempted.

Most candidates approached the solution by drawing one item at a time, mainly starting from the torso and either moving towards the head or towards the legs. It is clear that most candidates lack proper observation skills and carried out most of the drawing without properly looking at the given drawings for assistance. This resulted in most solutions being way far out of proportion or scale. A number of well scaled drawings on the other hand didn't make proper use of the given space, by drawing the solutions either too small or too large. With regards to colour and shading, there were few candidates that showed proper rendering techniques, both in colour and pencil. Most of the renderings were haphazardly executed or filled in one block of colour. A notable percentage of respondents didn't even colour or shade the solution as requested.

Candidates answering paper 2B could avail themselves from guidance by following the well-proportioned drawn torso. A small number of candidates failed to scale the rest of the robot's body correctly to such scale, with some also failing to add any depth to it, ending with a partly two-dimensional drawing instead. A small number of candidates in both papers also failed to understand that they needed to assemble the solution and just tried to copy the given exploded view of the robot on the side.

Freehand drawing should be given the attention it deserves, especially on the more graphical side of the subject. There also seems to be a lack of proper understanding of the purpose of the use of preparatory sketching as an overall catalyst. It must be made clear that freehand sketching should serve towards the development of ideas and the improvement in the design of final solutions.

The table below shows the performance of the candidates regarding question 4.

	0	**1 - 8**	**9 - 14**	**Full marks**	**Abs**	**Total**
Option A	3	233	80	1	1	318
Option B	1	77	19	0	11	108

Question No. 5 – Helix (barber pole) (15 marks)

In this question, the candidates were presented with a diagonally striped surface development which, when wrapped around a cylindrical pole, would form a helical pattern. Two illustrations of the barber pole were given.

- The vast majority of the candidates fared well.
- A number of candidates plotted the visible part of the lower helix and the just copied the others.
- Candidates were expected to differentiate between construction and the helix outline. Only a few managed to make a full complete neat drawing.
- In general, the shading was rather poor and only few candidates rendered the tube to appear cylindrical.

The table below shows the performance of the candidates regarding question 5.

	0	1 - 7	8 - 14	Full marks	Abs	Total
Option A	4	43	257	13	1	318
Option B	3	50	39	5	11	108

Question No. 6 – Interpenetration / Surface development (18 marks)

The question consisted of a cylinder intersected by a prismatic shield, which produced a curve of intersection. The candidates had to draw this curve in the end view and the perforated part in the development. The complete front and plan elevations in first angle projection and a 3-D model were given, along with the starting lines for the end elevations and the development. The joint line J-J was also labelled clearly in the plan, end and development. Most of the candidates attempted this question, with most of them presenting at least a partial solution for the end elevation. The vast majority also divided the circle into an equal number of parts, most of them going for the traditional 12 divisions. There were shortcomings when candidates transferred these divisions to the development. Interestingly enough, although it was not required, and no marks were allotted for freehand sketching, some solutions featured a sketched freehand version. The paper 2A version featured two extra curves with relation to paper 2B.

The following are some further general observations worth noting:

- Some confused the points in the end elevation, and some copied the same curve of intersection from the end or the complete front elevation to the development. This signals fundamental problems with orthographic projection.
- Some candidates attempted to draw an auxiliary elevation out of the plan.
- A few solutions featured numbered/labelled partitions, and this led to some candidates drawing a mirrored solution with more curves of intersection than necessary.
- Despite the fact that the intersection happened on a cylinder, quite a few candidates joined the intersection curve points in straight lines.
- The solutions for paper 2B were generally very poor.

The table below shows the performance of the candidates regarding question 6.

	0	1 - 10	11 - 17	Full marks	Abs	Total
Option A	4	181	130	2	1	318
Option B	4	79	14	0	11	108

Question No. 7 – Auxiliary Projection (18 marks)

A partial front elevation, a plan in first angle projection and a pictorial view of 4 soft toddler playing blocks were given. In this question, the candidates were asked to complete the front elevation and project an auxiliary elevation at 30° from the plan. The pictorial blocks were shaded in different tones to emphasise the fact that they are separate shapes. Hidden details were not required for this question. The starting X1-Y1 was given as well. The paper 2A version featured a curved slide while the 2B question had a sloping slide. Quite some candidates omitted the steps in the front elevation while producing an impeccable auxiliary elevation indicating that many candidates do not read the question thoroughly but instead start off straight away and in a mechanical fashion. Overall there was clear evidence that some candidates ran out of time and partially finished the question.

The following are some further general observations worth noting:

- Few candidates constructed a 'false' top view as if the auxiliary direction was not perpendicular to the plan but hovering somewhat above. This produced some fantastically erroneous solutions and could indicate that these candidates are somehow missing the viewpoint direction.
- Several candidates projected the back side of the plan instead of the front bottom side, which could indicate problems with the first angle projection concept.
- A few solutions were constructed in planometric, possibly confusing the topics with the question that featured in paper 1.
- The curved part proved to be the hardest to construct, as was expected, but some candidates did not even use projection lines from the front elevation.
- Overall the neatness was quite weak, and some solutions were very messy and smudgy.

The table below shows the performance of the candidates regarding question 7.

	0	1 - 9	10 - 17	Full marks	Abs	Total
Option A	6	118	165	28	1	318
Option B	9	68	19	1	11	108

Chairperson

2018 Examination Panel