UNIVERSITY OF MALTA

SECONDARY EDUCATION CERTIFICATE

SEC

GRAPHICAL COMMUNICATION

May 2015

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION

CERTIFICATE EXAMINATIONS BOARD

SEC Graphical Communication
May 2015 Session
Examiners' Report

Administration

Four temporarily stapled A3 drawing sheets with printed questions and starter lines were presented to each candidate for both Paper One and Paper Two. 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

As indicated in the statistical chart below, nearly three quarters of the candidates attained a pass mark in the Graphical Communication SEC examination. Amongst these there were a number of very well prepared candidates who were very well conversed with geometrical constructions, engineering drawing standards and freehand/creative sketching. A general improvement in the tackling of the two-point perspective question has also been noticed. However, as always, there were other candidates who lacked preparation in both knowledge of construction methods and drawing skills. The following is a general list of shortcomings noted by the markers:

- Lack of distinction between construction lines and outlines.
- Roughly drawn curves when joining plotted points in ellipse and helix.
- Lack of knowledge of geometric construction methods.
- Poor presentation.
- Evident lack of freehand sketching and rendering practice.
- Little knowledge of engineering standards and conventions.
- Apparent lack of time management.

Part 1: Statistical Information

The tables below show the distribution of grades for the May 2015 session.

GRADE	1	2	3	4	5	6	7	U	ABS	TOTAL
PAPER A	37	61	74	90	65			52	6	385
PAPER B				9	27	19	20	26	9	110
TOTAL	37	61	74	99	92	19	20	78	15	495
% OF TOTAL	7.47	12.32	14.95	20.00	18.59	3.84	4.04	15.76	3.03	100

Part 2: Comments regarding the candidates' performance.

Paper 1

Question No.1 - **Ellipse** (12 marks)

In this question the candidates were tested for their knowledge about geometrical construction of a vertical ellipse and normal. The candidates were asked to construct an elliptical wireless mouse icon having a major axis of 140mm and a minor axis of 90mm. Candidates were expected to locate the focal points of the ellipse, construct the normal at given point A, extending it to the vertical centre line and reflect (mirror) it at a given point B. Candidates were instructed to complete the icon.

A considerable number of candidates attempted this question successfully, however others lost marks due to the following reasons:

a. The curve of the ellipse was not drawn smoothly; in fact in many cases the curve was drawn with several inaccurate dark strokes from one point to another.
b. There was no difference between outlines and construction lines.
c. Some candidates instead of construction lines used dashes.
d. Some candidates erased their construction lines from their work making it difficult to identify the method used to construct the ellipse.
e. Difficulty in locating the focal points and constructing the normal on the ellipse.

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

	0	**1 - 6**	**7 - 11**	**Full marks**	**Abs**	**Total**
Option A	8	73	240	58	6	385
Option B	11	54	35	1	9	110

Question No.2 - **Tangential Arcs** (15 marks)

This question tested the candidates' ability and skill to handle compasses accurately and their knowledge of the principles of tangential arcs (touching circle / blending arcs). Candidates were instructed to complete the outline of a pc game controller symbol composed mostly of external and internal tangential arcs. Candidates were also expected to complete the profile of a wire composed of a straight line joining two quadrants. In the notes section of this question, candidates were asked to leave visible the necessary constructions to locate centres of the tangential arcs and show the points of tangencies.

A considerable number of candidates attempted this question and there were a good number who managed to attain high marks. Marks were lost due to the following reasons:

a. Some candidates did not know how to construct neither external nor internal tangential arcs. Locating centres of tangential arcs using trial and error methods is unacceptable. Candidates should always show the necessary constructions to locate centres.
b. Points of tangency were not shown clearly. A number of candidates marked the point of tangency with a small dot which was barely visible.
c. Summation and subtraction of the radii were written in an untidy manner and very close to the actual solution thus ruining the finishing of the drawing.
d. The quadrants to complete the profile of a wire were not drawn accurately because, apparently, some candidates did not read the dimension lines correctly.

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

	0	**1 - 7**	**8 - 14**	**Full marks**	**Abs**	**Total**
Option A	1	61	281	36	6	385
Option B	2	47	50	2	9	110

Question No. 3 - Geometric Constructions (10 marks)

In this question, candidates were tested for their knowledge of construction methods to ***Inscribe***, ***Escribe*** and ***Circumscribe*** circles and arcs to triangles and extended lines. Almost all students attempted this question, with many obtaining much of the marks allocated. Those who failed to obtain full marks did so because of the following shortcomings:

- Some candidates averted proper construction methods to find the needed centres and drawing the circles and the arc by trial and error.
- Other candidates switched bisecting sides and angles in and to triangles given in order to ***Circumscribe*** and ***Inscribe*** circles in and to them respectively;
- A number of candidates left out the construction to find the centre of the ***Escribed*** arc altogether.
- Others opted not to use construction lines and the entire drawing was lined in using bold and haphazardly drawn lines.

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

	0	**1 - 5**	**6 - 9**	**Full marks**	**Abs**	**Total**
Option A	2	45	279	53	6	385
Option B	7	31	60	3	9	110

Question No. 4 - Surface Development (15 marks)

This question sought to test the candidates' knowledge in obtaining an ***Orthographic Projection*** and a ***True Shape of cut*** from a given one-piece full ***Development***. Most candidates attempted this question with only a few obtaining the majority of the marks allocated. This was due to:

- the inability to properly transfer the ***True lengths*** of the truncation from the ***Development*** to the ***Front Elevation***;
- the inability to project the same truncation from the ***Front Elevation*** to the ***End elevation*** and ***Plan*** respectively;
- leaving out completely the ***True Shape*** of the cut.

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

	0	**1 - 7**	**8 - 14**	**Full marks**	**Abs**	**Total**
Option A	57	202	113	7	6	385
Option B	57	39	5	0	9	110

Question No. 5 - Locus of Mechanism (15 marks)

This question dealt with drawing a ***Locus*** of a simple mechanism. The majority of students obtained most of the marks from this question even though there were a number who only divided the semi-circle into a number of parts and left the entire question out. Other important marks were lost due to:

- failure in marking link AB with its proper measurement on slot XZ or failing to mark it for a sufficient number of times;
- failure in marking link CD with proper measurements on slot XY;
- failure in obtaining a smooth and accurate curve when joining the locus through points P.

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

	0	**1 - 7**	**8 - 14**	**Full marks**	**Abs**	**Total**
Option A	29	84	235	31	6	385
Option B	29	41	30	1	9	110

Question No.6 - **Sectional Views** (15 marks)

An exploded pictorial view, a complete plan and two incomplete elevations of an assembled cast iron wall bracket in first angle orthographic projection were given. Candidates were asked to continue the sectional front elevation on the cutting plane X – X and to continue the sectional End Elevation on the cutting plane Y –Y.

Most candidates attempted this question, but only few attained full marks. The most common difficulties encountered by the candidates were:

a. Most candidates found it difficult to construct two sectional views, in fact many candidates tried to construct the sectional end elevation on the cutting plane Y – Y, ignoring completely the sectional front elevation on the cutting plane X –X.
b. Candidates that attempted the sectional front elevation on the cutting plane X – X found it extremely difficult to apply the regulations regarding the sectioning of web / rib.
c. The regulations regarding the sectioning of webs and ribs still confuse a significant number of candidates even when constructing the sectional end elevation on the cutting plane Y – Y. These candidates are 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.
d. Lack of knowledge of the basic regulations regarding sectioning. A sectioned object should be indicated by equi-spaced thin lines drawn, where possible, at 45° and touching the outline.
e. Some candidates had no knowledge that when two adjacent parts of the assembly are sectioned, the section lines are drawn in opposite directions, ideally staggered.
f. Candidates did not use centre lines neither in the middle of the hole nor to show the small holes behind the hatching lines.

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

	0	**1 - 7**	**8 - 14**	**Full marks**	**Abs**	**Total**
Option A	23	174	180	2	6	385
Option B	17	72	12	0	9	110

Question No.7 - **Estimated 2-Point Perspective Drawing (**18 marks)

In this question the candidates were given three orthographic views and a pictorial illustration of a desk organiser and were asked to draw a two-point perspective drawing of the object. Most of the candidates attempted this question, the majority of whom attained more than 50% of the allotted marks. The average mark of the candidates who sat for Paper A was 11 out of 18 marks and the average for Paper B was 6 out of 18 marks. In general, the perspective drawing principles were adhered to and the method suggested in Appendix 4 of the SEC 029 syllabus has been widely accepted by the majority of the candidates. The following is a list of shortcomings that led to loss of marks:

a) Some candidates confused the method foreshortening in perspective drawing. This is apparently due to lack of practice. Some elements of the method proposed in Appendix 4 of the SEC 029 syllabus were adopted while, somewhere in the process, a step or two were missed. This led to distortions in the proportions.
b) Some other candidates did not use the method of foreshortening at all and simply marked the given measurements on the orthogonal lines, again resulting in distorted proportions.
c) There were candidates who used the vanishing points as measuring points. This resulted in considerable disproportion of the height of the given object.
d) A considerable number of candidates found difficulty in representing correctly the sloped partitions of the desk organiser. Most of these drew the slopes parallel to each other consequently disregarding the perspective rules.
e) Some candidates did not manage to complete the solution apparently due to lack of time management. Since this was the last question, these candidates did a last minute attempt by drawing the initial construction lines.

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

	0	**1 - 9**	**10 - 17**	**Full marks**	**Abs**	**Total**
Option A	2	145	201	31	6	385
Option B	7	67	24	3	9	110

Paper 2

Question No. 1 - Computer Graphics (12 marks)

In this question the candidates were given a printed grid and simple computer commands to plot a geometric design. Both paper 2A and 2B required knowledge of the DRAW, MOVE and MIRROR commands. The majority of the candidates used the correct colours. A good number of candidates successfully completed all the drawing and got very good marks however it is important to point out the following shortcomings found frequently in the drawings;

- Many students used pencil instead of the BLACK pencil colour. While still correct, this did not reflect unity in the answer.
- Some students used pens instead of coloured pencils. This resulted in very faint lines, hard to see and impossible to erase if drawn by mistake.
- Few students used the ORANGE colour instead of RED. These same students were using crayons instead of pencil colours and this resulted in a very poor presentation.
- Some students shaded the whole area inside the design, instead of just the outline.
- Few students marked the points with giant circles or crosses. Needless to say they were penalised for neatness and presentation.
- A number of students omitted the mirror commands and this is a weakness that needs to be addressed.

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

	0	**1 - 6**	**7 - 11**	**Full marks**	**Abs**	**Total**
Option A	15	28	270	65	7	385
Option B	11	21	62	5	11	110

Question No. 2 - Statistical Charts (12 marks)

Candidates were presented with a table of data and asked to draw a line graph in the printed axis provided together with a pie chart in the second part of the question. Both Paper 2A and Paper 2B questions required labelling of axis and units. Although most candidates labelled the units along the axis, the majority failed to label the variable of the axis (e.g. 'Years' in Paper 2A and 'Months' in Paper 2B) and getting a total of 11 instead of 12 marks. The first part of the question was answered correctly by most candidates sitting for Paper 2A, although many used different line types instead of colours to differentiate between variables in the key and graph. Quite a large number of candidates sitting for Paper 2B did not present a satisfactory solution for the first part of the question. Many presented a bar chart instead of a line graph. A small number of solutions in Paper 2A also presented bar charts. It should be noted that some candidates sitting for Paper 2B presented the three lines of the line graph starting from the 0, 0 point. Although candidates were not penalised for this since the rest of the graph was correct, this is not the correct way for drawing the graph.

As for the second part of the question, candidates had to produce a pie chart displaying the statistical data presented. A good number of solutions showed that candidates were able to convert the statistical data into angles for the pie chart. Some found difficulty in drawing the pie chart in 3D form for Paper 2A. The majority of solutions in both Paper 2A and Paper 2B lacked in presentation, either due to incorrect use of colour or without any colour or rendering. Being a graphical representation question, it is very important that candidates are able to use their skills to visually enhance the data presented.

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

	0	**1 - 6**	**7 - 11**	**Full marks**	**Abs**	**Total**
Option A	5	46	306	21	7	385
Option B	0	39	54	6	11	110

Question No. 3 – Graphic Symbols (12 marks)

Candidates were presented with a set of icons and were required to draw sketches and a final realisation of the icon matching in style to those given. Although there were quite a few commendable designs especially in Paper 2A, a considerable number of solutions in both Paper 2A and Paper 2B did not match the style given. Designing and shading the background of the drawn icons should have been essential in making the icons part of the 'group' given, something that very few candidates realised in their drawings. Solutions including words lost marks. It is important to note that the sketch should convey the message or subject in the simplest manner. The final realisation should look clean, neat and drawn using instruments wherever possible. Attention should be given to the quality of rendering to enhance rather than spoil the drawing.

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

	0	**1 - 6**	**7 - 11**	**Full marks**	**Abs**	**Total**
Option A	2	99	242	35	7	385
Option B	1	33	63	2	11	110

Question No. 4 – Assembly drawing / Freehand Sketching (14 marks)

In this question, candidates were given orthographic views of a trophy in Paper 2A and a pencil sharpener in Paper 2B. They were required to draw a freehand isometric drawing of the assembled parts and render it to show different materials. Most drawings in both papers showed that candidates do not use an isometric structure to aid in guiding them with 'building' the shape in a cohesive and proportional drawing. Although there were a few good drawings, it is clear that candidates should be better prepared for questions involving freehand and presentation skills. The main reasons that lost marks in this question were:

- for using instruments in the drawing,
- drawing an exploded view rather than assembly,
- showing no texture to represent different materials,
- poor quality rendering,
- drawing too small compared to the space available.

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

	0	**1 - 7**	**8 - 13**	**Full marks**	**Abs**	**Total**
Option A	4	118	246	10	7	385
Option B	5	41	53	0	11	110

Question No. 5 - Intersection of solids (14 marks)

In this question the candidates were presented with a regular pentagonal prism in Paper A and a triangular prism in Paper B intersected at 90° by a circular cut to create a hanging bottle rack. The question was within the syllabus framework and it was well presented and explained. As an overview, the majority of the candidates knew how to project the necessary construction lines. However, fewer students managed to answer the question fully correct due to the following reasons:

- A good number of candidates managed to do only the front part of the curve and left out the back part completely. This was due to the fact that the approximate shape of the front curve was indicated on the given illustration, while the back part was hidden by the bottle. Some candidates did not visualise this hidden curve and were therefore not able to continue the missing curve at the back.
- It was also noted that only a few Paper A candidates managed to identify and draw the two vertical lines which represent the back edges of the pentagonal prism. These lines became visible as a result of the cylindrical cut.
- Some candidates tried to obtain the curves of intersection without even projecting lines on the Plan.
- Others for a reason only plotted half the curve leaving the other half missing.
- Others didn't divide the circle into equal parts and worked only on the quadrant points.

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

	0	**1 - 7**	**8 - 13**	**Full marks**	**Abs**	**Total**
Option A	19	103	243	13	7	385
Option B	8	54	30	7	11	110

Question No. 6 - Helix (18 marks)

For this question, Paper A candidates were presented with a rectangular helix, discarding the upper face leaving the helix in the form of a passage way. The question was well presented, within the syllabus and yet different than usual. Candidates had all the necessary lines and points to start and continue the drawing. Paper B candidates were asked to plot one and half turn of a Helix in a manner of a blade thus making use of inner and outer cylinders. Candidates who have a good graphical background did well in this question and produced accurate, neat and sharp solutions. Others lost marks due to the following reasons:

- A number of candidates lacked presentation, neatness and organised geometry.
- The division of a line was not always equally spaced.
- Some candidates located the intersecting points unsystematically. This created confusion when the final curve was joined.
- A number of Paper A candidates ignored completely the inner cylinder.
- Some other candidates produced very poor freehand curves.

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

	0	**1 - 9**	**10 - 17**	**Full marks**	**Abs**	**Total**
Option A	14	111	230	23	7	385
Option B	11	51	28	9	11	110

Question No. 7 - Auxiliary View (18 marks)

Candidates were asked to project an Auxiliary Elevation from a given Front and Plan of a stepped archway prop. The first part of the question involved drawing a 3D freehand sketch of the object in an indicated area of the answer sheet. The second part consisted of the actual Auxiliary projection with the XY line given as a starting point. Hidden details were not required in both paper 2A and 2B. The questions involved projecting a circular part in the solution. Suffering from lack of time (last question), lack of knowledge or otherwise, the majority of the students fared badly in this question. A large number of freehand sketches were poor to say the least, some of them unrecognisable and some even drawn using rulers and instruments. Few candidates drew the freehand as if looking at the object from behind or below. Quite a lot of candidates left parts of this question out while some simply copied the Front elevation on the XY line as their solution. It was also noticed that a good number of students took it for granted that the steps height was 10mm while this was not the case in both papers. This shows clearly that the candidates were not transferring the heights using instruments (dividers/compasses) but using other inaccurate methods. It seemed that most students understood the concept that the circular part needs to be sliced into smaller parts and that the 30° lines are projected from the Plan.

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

	0	**1 - 9**	**10 - 17**	**Full marks**	**Abs**	**Total**
Option A	4	215	154	5	7	385
Option B	9	69	21	0	11	110

Chairperson

2015 Examination Panel