

**UNIVERSITY OF MALTA  
SECONDARY EDUCATION CERTIFICATE  
SEC**

**GRAPHICAL COMMUNICATION  
May 2016**

**EXAMINERS' REPORT**

**MATRICULATION AND SECONDARY EDUCATION  
CERTIFICATE EXAMINATIONS BOARD**

## SEC EXAMINERS' REPORT MAY 2016

### SEC Graphical Communication May 2016 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.

#### General Comment

As indicated in the statistical chart below, three quarters of the candidates attained a pass mark in the Graphical Communication SEC examination. As evident from their work, these candidates were well prepared for the examination. They were well conversed with geometrical constructions, engineering drawing standards, freehand sketching and drawing skills. Another third scored over 60 marks. The following is a general list of shortcomings noted by the markers:

- Lack of pencil control to distinguish between construction lines and outlines.
- Lack of knowledge of geometric constructions.
- Poor presentation especially when drawing freehand curves.
- Lack of freehand sketching and rendering practice.
- Little knowledge of engineering standards and conventions.
- Poor drawing skills and inability to simplify graphic symbols.
- Difficulty in applying learnt knowledge to solve the given problems.

#### Part 1: Statistical Information

The tables below show the distribution of grades for the May 2016 session.

GRADE	1	2	3	4	5	6	7	U	ABS	TOTAL
PAPER A	32	58	84	90	84	-	-	52	4	404
PAPER B	-	-	-	10	30	20	20	27	3	110
TOTAL	32	58	84	100	114	20	20	79	7	514
% OF TOTAL	6.2	11.3	16.3	19.5	22.2	3.9	3.9	15.4	1.4	100.0

## SEC EXAMINERS' REPORT MAY 2016

### Part 2: Comments regarding the candidates' performance.

#### Paper 1

#### Question No.1 - Tangential Arcs (12 marks)

In this question, candidates were tested for their knowledge in constructing tangential arcs. Candidates were expected to complete the profile of a Chess Pawn by using the appropriate construction necessary in order to obtain the centres for the needed tangential arcs.

- The majority of candidates attempted this question, with only a few being able to obtain full marks.
- Most candidates marked the upper  $\varnothing 56\text{mm}$  circle correctly.
- Most had trouble in finding the exact centres for the upper 10mm and 12mm arcs.
- Most candidates were successful in finding the centres and drawing the lower 16mm and 14mm arcs, but had trouble with plotting the centres and drawing the 48mm and 21mm arcs respectively.
- Very few candidates did successfully mark the location of the points of tangency with short lines.

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

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	1	111	267	21	4	404
Option B	3	62	39	2	4	110

#### Question No.2 - Ellipse (12 marks)

In this question, the candidates were tested for their knowledge in the geometric construction of two semi-Ellipses and a Normal. The candidates were expected to complete the profile of a Sand Timer using the two semi-Ellipses together with two tangential arcs.

- The majority of candidates were able to construct the two semi-ellipses correctly with some shifting the points of the upper half to obtain the corresponding points for the lower one.
  - Most candidates preferred using the concentric circle method as their means of construction.
  - A considerable number of candidates failed to locate and annotate the Focal points, and in so doing also failed to construct the requested normal (required to locate the correct centres for the tangential arcs). In such cases, these centres were found by trial and error.
  - The minority of the candidates drew the freehand curve smoothly and neatly.
- The table below shows the performance of the candidates regarding question 2.

**SEC EXAMINERS' REPORT MAY 2016**

	<b>0</b>	<b>1 - 6</b>	<b>7 - 11</b>	<b>Full marks</b>	<b>Abs</b>	<b>Total</b>
<b>Option A</b>	13	116	187	84	4	404
<b>Option B</b>	31	46	25	4	4	110

**Question No. 3 - Geometric Constructions (14 marks)**

In this question, candidates were tested for their knowledge of constructing an internal tangent between 2 circles of unequal diameter, the construction of an arc using the 3-point circle method, and the construction of an octagon.

- The majority of candidates failed to obtain the proper construction for the internal tangent and only drew the bisection of line between the two circles.
- Some did also add a semi-circle to the bisection of the distance between the 2 circles.
- Very few candidates obtained the entire construction for the tangent correctly.
- The majority also failed to find the centre of the lower arc by using the 3-point circle method and just used an estimated centre to draw the arcs.
- Most candidates also failed to use a proper construction method for the drawing of the octagon.
- Most assumed the base of the octagon as being the same size as the diameter of the upper circle and totally ignored the measurement of its given width.

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

	<b>0</b>	<b>1 - 7</b>	<b>8 - 13</b>	<b>Full marks</b>	<b>Abs</b>	<b>Total</b>
<b>Option A</b>	1	278	107	14	4	404
<b>Option B</b>	4	97	4	1	4	110

**Question No. 4 - Surface Development (14 marks)**

This question tested the candidates' knowledge on how to apply the principles of surface development. A front elevation and a plan (in first angle orthographic projection) of a cardboard model of an Ice-Cream Kiosk were given. The model of the Ice-Cream Kiosk was made from a semi-octagonal prism and a semi-octagonal pyramid. Starting lines were given and candidates were expected to construct the surface development of the semi-octagonal prism including five faces and three windows. Additionally, candidates had to construct the surface development of the semi-octagonal pyramid designed also with five faces. The two developments had to be joined together in order to be cut from one piece of cardboard.

## SEC EXAMINERS' REPORT MAY 2016

The following are a number of errors which were noted:

- a) A number of candidates did not construct correctly the surface development of the semi-octagonal prism and the three windows. Most of these simply copied the given front elevation.
- b) Some candidates did not join the two developments. The connection was indicated by two arrows.
- c) A significant number of candidates did not find the true length of the edges of the pyramid, and hence they did not construct development of the semi-octagonal pyramid correctly.
- d) Some candidates did not draw folding lines.

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

	0	1 - 7	8 - 13	Full marks	Abs	Total
<b>Option A</b>	34	184	176	6	4	404
<b>Option B</b>	34	62	10	0	4	110

### Question No. 5 - Enlargement (15 marks)

This question featured the enlargement of a figure by radial projection from a given corner labelled 'A'. A cardboard profile of a movie camera graphic symbol was positioned on a plastic sheet labelled ABCD. Candidates had to construct the largest similar figure to be cut from the plastic sheet.

The majority of candidates showed adequate understanding on how to use radial lines and parallel lines to enlarge the movie camera graphic symbol. Despite this, only a few candidates managed to close the movie camera graphic symbol in a rectangle in order to determine the correct largest enlargement on the plastic sheet. Instead of this method, most candidates opted for trial and error. The most common pitfall of candidates was that they did not know how to find the centre of the circles. Candidates also found it difficult to construct the new enlarged radii of the circles. In fact, many candidates tried to find the new radiuses by adopting an arithmetic method of simple proportion.

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

	0	1 - 7	8 - 14	Full marks	Abs	Total
<b>Option A</b>	17	47	294	42	4	404
<b>Option B</b>	29	20	55	2	4	110

## SEC EXAMINERS' REPORT MAY 2016

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

This question tested the candidates' understanding of the principle of orthographic projection and their knowledge about sectioning regulations. Candidates were given a plan, an end elevation and an incomplete front elevation of a guide block. Before projecting the sectional front elevation on cutting plane X – X, the candidates were asked to draw a 3D freehand sketch of the sectioned guide block in a provided space.

The majority of the candidates performed relatively well in this question, however only a small number attained full marks. The following are the main hitches which are worth noting:

- a) Several candidates drew a 2D freehand sketch (instead of 3D) of the solution giving the impression that they did not read the question carefully.
- b) The regulations regarding sectioning were not always followed. A sectional object should be shown by thin lines drawn preferably at 45° and touching the outline. The lines should be equally spaced.
- c) Some candidates hatched the right hand and the left hand web even though they were 'cut' longitudinally. BS308 clearly states that a web is not sectioned even if it lies in a given cutting plane, that is, if it is 'cut' longitudinally.
- d) A good number of candidates did not draw centre lines, which should also be drawn behind the hatching lines to indicate hidden holes.
- e) Most candidates did not draw the fillets in the sectional front elevation.

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

	0	1 - 7	8 - 14	Full marks	Abs	Total
Option A	6	141	251	2	4	404
Option B	16	69	21	0	4	110

### Question No.7 - Estimated One-Point Perspective Drawing (18 marks)

In this question, the candidates were tested for their knowledge and personal judgement in constructing an estimated one-point perspective drawing. Candidates were expected to draw a well-proportioned perspective drawing of a room which included a desk, small cabinet, wall cabinet and a carpet. The room outline and the starting two tiles were given. The room was rectangular in the shape of 10 tiles wide and 8 tiles deep. The candidates were asked to complete the perspective grid, draw the furniture, the door and the desk chair.

It is important to note that the vast majority of candidates attempted this question despite being the last question and some left other questions out. This shows clearly that candidates selected the order of the questions themselves and did not go through the paper sequentially.

## SEC EXAMINERS' REPORT MAY 2016

The following are some general observations worth noting and thinking upon by educators;

- A lot of candidates divided the room into 10X10 tiles drawing the diagonal line across the whole floor.
- A good number of candidates cleverly divided diagonally the left hand wall to obtain the floor tiles as the wall was 8 courses high.
- Some candidates divided the room width into 8 to determine the depths and then rubbed off the construction. This method gave very messy solutions.
- Some candidates used the diagonal method inside the tiles and kept on dividing till they got 8 depths. This resulted in a lot of confusing diagonal lines.
- There were many candidates who constructed a very short desk. They did not take the correct measurements around the room walls.
- Some candidates converted the door into a window.
- Overall neatness and accuracy was disappointing.

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

	<b>0</b>	<b>1 - 9</b>	<b>10 - 17</b>	<b>Full marks</b>	<b>Abs</b>	<b>Total</b>
<b>Option A</b>	0	154	242	4	4	404
<b>Option B</b>	3	71	31	1	4	110

## SEC EXAMINERS' REPORT MAY 2016

### Paper 2

#### Question No. 1 - Computer Graphics (10 marks)

This question was about computer graphics. Candidates had to follow the program command and design the required profile. The majority of the candidates answered in the corrected manner. The most common mistake in Paper 2A was the large rectangular part. Many did it in a form of a quadrilateral. This shows that one point was commonly mistaken. Regarding colour, the majority of students understood the colour scheme and coloured the lines adoringly. However, there were a number of candidates who filled the whole drawing. This idea erased some line details from the design. Overall all good question and good response.

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

	0	1 - 4	5 - 9	Full marks	Abs	Total
Option A	5	9	157	227	6	404
Option B	8	17	47	34	4	110

#### Question No. 2 - Vectors (10 marks)

This question was about vectors where candidates had to find the resultant force. It was noted that only a handful of candidates showed that the resultant force has to be in opposite direction of the vector diagram. Another common mistake was the parallel. Some of the candidates for a reason or another didn't make proper parallel lines from the space diagram. This resulted in wrong resultant answer and subtracting marks at the end. With reference to arrows many lack standards and labelling. Vectors need to be properly arrowed and labelled accordingly. Overall question was good level and was understood and workable.

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

	0	1 - 5	6 - 9	Full marks	Abs	Total
Option A	23	94	238	43	6	404
Option B	32	60	8	6	4	110

## SEC EXAMINERS' REPORT MAY 2016

### Question No. 3 – Graphic Symbols (15 marks)

In this question, candidates were required to draw preliminary sketches and a final drawing depicting the correct colours for the safety signs. In Paper 2A, candidates needed to know the correct colours for prohibition and mandatory signs in accordance with approved conventions, i.e. white background, black sign and red outer circle with a diagonal for the prohibition sign and a blue background with a white sign and outer white circle for the mandatory sign. Candidates were given a pictorial drawing, which helped considerably in generating ideas for drawing the signs. The majority of candidates were successful in conveying the message in a simple manner and got a pass mark in this question. However, a number of candidates attempted drawing the given scene instead of reducing the message into a minimalistic symbol which should convey just the idea. In general, the presentation of the symbol left much to be desired. Attention should be given to the quality of the final realization rendering it neatly and using instruments whenever possible.

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

	0	1 - 7	8 - 14	Full marks	Abs	Total
Option A	1	73	275	49	6	404
Option B	3	15	82	6	4	110

### Question No. 4 – Archimedean Spiral (15 marks)

This question tested the candidates' ability to draw an Archimedean spiral. Candidates sitting for Paper 2A were required to do two turns, hence dividing the given distance in 24 parts whilst those in Paper 2B were asked to do just one turn; 12 parts. Dividing into the correct number was the main reason for losing marks in this question. A small number of candidates in Paper 2B mistook the spiral for an involute or just drew a random curve.

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

	0	1 - 8	9 - 14	Full marks	Abs	Total
Option A	5	71	176	146	6	404
Option B	2	64	21	19	4	110

## SEC EXAMINERS' REPORT MAY 2016

### Question No. 5 – Auxiliary View (16 marks)

In this question, candidates were presented with orthographic views of a trophy, having a circular base and a truncated octagonal prism with a Maltese cross design on the surface of the cut. Candidates had to project an auxiliary plan. It was noted that a good number of candidates focused only on the true shape of the truncation, showing the elongated octagon and the Maltese cross. This could be because during lessons truncated prisms are widely used to explain true shape of cut. With reference to the circular base, the level was a bit poor. A number of candidates confused upper and lower projections and produced poor freehand curves. Others, projected the circular base as a rectangle. Probably because they referred to the end view. However, these errors show that these candidates didn't focus enough on the given 3D illustration which was intended to help them visualize shape of the trophy.

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

	0	1 - 7	8 - 15	Full marks	Abs	Total
Option A	36	195	124	43	6	404
Option B	11	40	55	0	4	110

### Question No. 6 – Cabinet Oblique Drawing (16 marks)

In Paper 2A, candidates were presented with an orthographic projection of a first prize trophy. They were asked to draw and colour a well-proportioned freehand sketch. They were also requested to produce an oblique drawing. Few candidates achieved full marks, the main reason being the incorrect alignment of the truncated pyramid and the cylindrical medal on top.

In Paper 2B, candidates were given orthographic views of a sidewalk sign. The main difficulty in this question was in drawing the thickness of the sidewalk sign.

In both papers, some candidates used a 30° angle instead of a 45°, or drew the depth of the oblique drawing in full size.

In general, the rendering in both papers was poor, with little resemblance to actual material

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

	0	1 - 8	9 - 14	Full marks	Abs	Total
Option A	2	144	228	24	6	404
Option B	3	37	65	1	4	110

## SEC EXAMINERS' REPORT MAY 2016

### Question No. 7 – Interpenetrations / Surface developments (18 marks)

In Paper 2A, the candidates were tested for their knowledge of orthographic projection, interpenetrations, conic sections and part-surface developments. The candidates were given complete and incomplete orthographic views of a toy plane which consisted of a combined cylinder and cone. They had to project the interpenetration curve and the hyperbolic curve in the plan. They also had to construct the surface developments of the cockpit and window. Finally, the candidates were asked to write down the name of the conic section (hyperbola) in the space given.

Generally speaking, almost everyone attempted this question but the vast majority stopped mid-way through the working. This could be due to time limits or due to the reason that the question becomes progressively more challenging in the last steps.

The following are some general observations with regards to this question;

- Very few divided the end elevation into a number of equal parts.
- Only a handful constructed the radial lines following the cone in the plan.
- The conical surface development and true lengths were done by very few candidates.
- Candidates lacked skills in drawing neat freehand curves.
- The names of the conic section were both exotic and varied. Almost everyone attempted to name it but only a handful got it right.

In Paper 2B, the candidates had to complete the orthographic views of a toy submarine. This task included the interpenetration curve/lines created by the conning tower and the rectangular windows, the location of the waterline and the hyperbolic curve in the plan. The two extreme radial lines for the tail conic section were given as faint lines.

Most of the candidates constructed the submarine rectangular windows but very few projected the conning tower interpenetration correctly. Almost no one got the conic section in the tail right.

The following are some general observations with regards to this question;

- Very few divided the end elevation into a number of equal parts.
- Few realised that the front part is a semi-circle and some candidates did it freehand.
- Almost no one constructed the conical radials to draw the hyperbola.
- Amongst the candidates that attempted this question, neatness and accuracy were relatively good.

## SEC EXAMINERS' REPORT MAY 2016

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

	<b>0</b>	<b>1 - 9</b>	<b>10 - 17</b>	<b>Full marks</b>	<b>Abs</b>	<b>Total</b>
<b>Option A</b>	2	330	64	2	6	404
<b>Option B</b>	11	81	14	0	4	110

**Chairperson**

**2016 Examination Panel**