UNIVERSITY OF MALTA

SECONDARY EDUCATION CERTIFICATE
SEC

GRAPHICAL COMMUNICATION

May 2010

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SEC Graphical Communication
May 2010 Session
Examiners' Report

Part 1: Statistical Information

Table 1 below summarizes the general performance in the examination.

Table 1: Distribution of the candidates' grades for May 2010.

GRADE	1	2	3	4	5	6	7	U	ABS	TOTAL
PAPER A	41	77	97	107	103			67	5	497
PAPER B				17	50	75	38	34	12	226
TOTAL	41	77	97	124	153	75	38	101	17	723
% OF TOTAL	5.67	10.65	13.42	17.15	21.16	10.37	5.26	13.97	2.35	100

The examination consists of two written papers, each of two hours duration. Paper 1 is common to all candidates. Paper 2 is set in two versions: Paper 2A and Paper 2B, with the candidates opting for which paper to sit. Questions in Paper 2B are easier than those set in Paper 2A. Each paper carries 100 marks and a candidate's final result is determined by combining the scores obtained in Paper 1 and Paper 2 with equal weighting.

A total of 723 candidates sat for the examination with 497 opting for Paper 2A and 226 opting for Paper 2B.

Part 2: Comments regarding candidates' performance

This section gives comments on the performance of the candidates. They are intended to aid teachers and candidates in preparation for future examinations.

Paper 1

Seven questions were set and candidates had to answer them all. Different questions carried different marks.

Question 1 – Heptagon/isosceles triangle

Part (i) concerned constructing a regular heptagon within a given circle. A big majority of the candidates produced a perfect solution and earned full marks. The others found difficulties with various aspects of the question. Some of these were:

- not knowing that a heptagon is seven-sided, and hence produced other polygons; it is good to note that a heptagon may alternatively be called a septagon.
- had no idea of the constructional method to follow and used the protractor instead;
- had a vague idea of the method but used a point on the divided diameter other than point 2. It is important to stress that point 2 is in fact the point to use to draw *any* polygon inside a circle.

Another remark concerns the practice used by candidates to perform the division of a line. Theoretically it makes no difference what size of length is used to mark the number of required parts on the new line drawn at any angle. In practice however the accuracy is very much compromised if the length assumed is very different from the expected result. The students should be trained to estimate and use a length which reasonably compares with the final divided parts of the line.

Another word of advice regards how to draw a polygon *with an odd number of sides* inside a circle once the side is found. It is best to draw mark off the side symmetrically about a diameter to even out any inaccuracies.

Part (ii) was answered correctly by the vast majority of the candidates, even though the question contained a minor slip. The 45mm vertical height was superfluously given in the question text. This was well taken in consideration in the award of the marks.

Distribution of marks for Question 1

0 marks	1-5 marks	6-9 marks	Full 10 marks
0%	35.6%	35.7%	28.7%

Question 2 – The ellipse

The question asked the students to draw an ellipse on given axes. The majority of the students assumed the major and minor axis correctly and used the concentric circle method to produce the ellipse. A few number of candidates made use of the intersecting radial lines method (also known as the rectangle method) but most of them failed to originate the radial lines from the correct points. Some students did not use any method; they just drew the ellipse 'by the eye', attracting no marks. Most of the marks in this question were deducted from the second part of the question. This involved locating the focal points and constructing the normal at the given point N. This part was entirely left out by a large number of candidates. This is very disappointing when one considers that the ellipse features so prominently (and rightly so) in the syllabus.

Distribution of marks for Question 2

0 marks	1-5 marks	6-9 marks	Full 10 marks
3%	20.7%	40.4%	35.9%

Question 3 – Mechanism/loci

The locus of the bottom of an up and over garage door was requested. Only a small number of candidates did not realise that CD followed a semi-circular motion about C. Some candidates chose to divide the semicircular locus of CD while others opted to consider incremental positions between A and A_1. But methods are correct and were equally credited. Some candidates worked out the positions assumed by the bottom of the door but then did not join them by a proper smooth curve to produce the locus.

Distribution of marks for Question 3

0 marks	1-7 marks	8-13 marks	Full 14 marks
16.9%	29.3%	20%	33.8%

Question 4 – Conical section

The question consisted essentially in deriving the left end view and plan of a truncated shade. The shade consisted of a hollow cone joined to a short cylindrical pipe. The exercise tested the candidates on their ability to use projection techniques to trace suitable points around the views after these are assumed on the given truncation ABC. To project through views is an essential rudiment of orthographic projection, which is practised through all the stages of the secondary course. Yet many students could not even get started. They even failed to make use of a proper line at 45º to facilitate the projection between the plan and the end elevation.

Only few candidates realised that the truncation ABC simply generated two vertical lines in the plan.

The end elevation could be deduced using any of two principal methods or, more preferably, a combination of both. These are the method of sections and the generator method. The latter was the more widely employed and a word of advice is warranted. *The generator method gets much less accurate as the generator becomes 'more parallel' to the direction of viewing*. The use of the method of sections then becomes necessary.

Distribution of marks for Question 4

0 marks	1-7 marks	8-13 marks	Full 14 marks
6.8%	68.9%	22.9%	1.4%

Question 5 – Blending of curves

The question asked the students to draw a lady's shoe by blending together suitable arcs and lines.

Students must be aware that circles which touch have their contact point located on the line joining their centres, this being produced if necessary.

Candidate attempting such questions must leave the constructional work showing. Despite specific statements in the question that 'constructional arcs must not be erased and the points of tangency must be left clearly visible', many candidates produced answers lacking any signs of constructional work. Candidates are reminded that such answers, produced by trial and errors, attract absolutely no marks. The final presentation must show the arcs blending smoothly, with the centres properly located on the line joining the centres. Accuracy, neatness and the use of sharp lines/arcs are other essential details of questions dealing with the blending of curves.

Distribution of marks for Question 5

0 marks	1-8 marks	9-15 marks	Full 16 marks
0.6%	23.7%	66.4%	9.3%

Question 6 – Sectional plan

Front and end elevations of a cast bracket were given. The candidates were asked to draw a sectional plan as instructed in the front elevation. A significant number of candidates drew a plan of uniform width. The isometric view accompanying the question clearly explained that this was not the case. These mistakes could have easily been avoided had the candidates studied properly the given drawings. Most candidates sectioned correctly the cylindrical housing.

In most cases the fillet radii were ignored and replaced by sharp corners. Centrelines were not properly inserted or left out completely. Section hatching lines were irregularly spaced or substituted by 'artistic' pencil-shading in some cases. Students are reminded that sectioned areas must be indicated by proper hatching lines drawn at 45º.

In the second part of the question, candidates were requested to draw the symbol of projection used. This was completely ignored, not understood or merely left out because it carried only two marks. Some of the candidates who did attempt this part, produced projection symbols of unsuitable proportions. Others still cannot distinguish between the First and Third Angle orthographic projections.

Distribution of marks for Question 6

0 marks	1-9 marks	10-17 marks	Full 18 marks
4.4%	26.2%	66.4%	3%

Question 7 – Perspective drawing

The question tested techniques used in perspective drawing, particularly the task of dividing an area into a number of equal receding smaller areas. The exercise merely consisted in dividing the receding sides of a shed into eight equal parts, when its vertical height was also divided into eight equal parts. The established 'method of the diagonal', crossing a set of eight lines receding towards the VPs on either side of the front vertical edge, would have given the most speedy solution. Many students, instead, opted to make use of more sophisticated methods that make use of measurements. The students read off and assumed the required measurements as these were not given. Whilst all successful methods were duly credited, it must be noted that the use of such elaborate methods is only recommended when the simpler, more established methods prove inadequate. Such a case would be if, for instance, the enclosing crate is not given. A minority of the candidates even devised their own enclosing crate and ignored the bold print of the question to 'fit the drawing in the given crate'.

Many candidates showed no minimum knowledge of perspective drawing as they represented the eight receding parts by dimensionally-equal areas. These were obtained using the method of dividing a line into a number of equal parts. They treated perspective as though it were a kind of parallel-line drawing. Instead perspective is based on the fundamental property that lengths get smaller the further they recede into the distance.

Distribution of marks for Question 7

0 marks	1-9 marks	10-17 marks	Full 18 marks
6.1%	59.4%	28.4%	6.1%

Paper II

Seven questions were set and candidates had to answer them all. Different questions carried different marks.

Question 1 –Helical curves

This was a question on the projection of helical paths. Such curves are controlled by the diameter of the associated circular motion and the pitch. A significant number of candidates did not realise that the helices used a pitch of 60mm. Many candidates divided the overall vertical distance travelled by P and Q into a wrong number of parts. In paper 2A, this was commonly divided into 12 instead of 14 parts and in paper 2B, into 18 instead of the 20 divisions required. In many cases the divisions were not regular (i.e. not dimensionally equal) and the overall accuracy and presentation were generally poor. After three years of secondary schooling in the subject, students are expected to develop a good hand at producing smooth curves extending between a set of points.

Nevertheless a number of candidates from each paper produced perfect solutions and scored full marks.

Distribution of marks for Question 1

	0 marks	1-6 marks	7-11 marks	Full 12 marks
Paper 2A	0.8%	17.3%	50.9%	31%
Paper 2B	23.9%	39.2%	31.1%	5.8%

Question 2 – Warning sign

The question required the candidates to develop warning signs. Whilst Paper 2A candidates had to consider two situations, only one design was requested from candidates sitting Paper 2B. Most candidates adopted yellow/black or red/white/black combinations for the warning signs, and both of these were accepted. However, some of the paper 2A candidates failed to make use of the triangular format which is

characteristic of warning signs. Very few candidates produced simple block designs that effectively represented the intended message. Some candidates even used words in their design. On the whole, the quality of the designs produced was very low, suggesting that most students still fail to appreciate the basic features that make up a good sign.

Distribution of marks for Question 2

	0 marks	1-6 marks	7-11 marks	Full 12 marks
Paper 2A	0%	30.6%	62.5%	6.9%
Paper 2B	2.4%	61.2%	35.9%	0.5%

Question 3 – Concurrent forces

The question featured a graphical vector analysis of a state of equilibrium of a system of concurrent forces. Concurrent forces in equilibrium are conveniently represented by a closing polygon of forces having a null resultant. Scaled line segments having the right inclination were used by the vast majority of students. However many failed to represent the 'sense' aspect of the forces as they did not place the appropriate arrows on the 'vectors'. Moreover some candidates did not connect the vectors to construct a polygon but simply redrew suitable vectors about a common point, achieving nothing. A good number of candidates did know the full correct method how to solve the question, but in some occasions the magnitudes found of P and Q were not accurate.

Distribution of marks for Question 3

	0 marks	1-6 marks	7-11 marks	Full 12 marks
Paper 2A	3%	21.8%	25.3%	49.9%
Paper 2B	38.3%	34.5%	14.8%	12.4%

Question 4 – True lengths

This question tested the candidates' ability to evaluate true lengths using geometrical methods. It presented a situation in which a cable is laid diagonally across a saw-toothed factory roof. A front view and a plan were given and the candidates had to determine the true length of the cable and the true angle (only in paper 2A) it made with the horizontal.

An encouraging fact is that the candidates made use of a variety of methods which all led to the same answer. However there were also other candidates who did not have the faintest idea what to do. In fact some candidates measured the required length directly from the front elevation, while others tried to calculate the true length mathematically using Pythagoras' theorem, with no success. Needless to say, the solutions to an examination in Graphical Communication need to be found geometrically with all the necessary construction being clearly shown.

A number of candidates sitting Paper 2B did not even attempt this question.

Distribution of marks for Question 4

	0 marks	1-7 marks	8-13 marks	Full 14 marks
Paper 2A	4.9%	60.3%	24%	10.8%
Paper 2B	14.8%	79%	4.8%	1.4%

Question 5 – Computer programme

A computer programme was presented to the candidates who had to interpret it and produce line symbols for some electrical equipment. This sort of question has now become established with the majority of the candidates scoring good marks.

A few candidates found difficulty deciphering the given data, making hardly any progress towards the actual images the program represented. Other candidates drew the required lines freehand causing undesirable crooked images. To make it worse, unsharpened thick-pointed pencils were often used, rendering the symbols untidy and unsightly.

The answer to the written question requested in paper 2A was intended to be open-ended with all plausible replies being acceptable. The candidates seem to share the same general opinion regarding the advantages of Computer Aided Draughting (CAD), for the majority of the replies revolved around the fact that "computers do not make mistakes like human beings". More objective plausible reasons in favour of CAD might have included:

- the ease of editing;
- the benefit of electronic storage;
- the precision achievable: the facility of using consistently different line types and line thicknesses;
- the size of the drawing paper being no longer a restriction; CAD can handle any size.

Distribution of marks for Question 5

	0 marks	1-8 marks	9-15 marks	Full 16 marks
Paper 2A	2.4%	5.3%	77%	15.3%
Paper 2B	12.9%	14.8%	54.1%	18.2%

Question 6 - Auxiliary view

A front elevation and a plan of a guitar resting on a horizontal plane were given. An auxiliary plan, looking on the elevation at an angle clearly indicated by an arrow, was requested on a printed X-Y line.

A very good number of candidates managed to present a neat and accurate auxiliary plan, scoring full marks. Other students derived the auxiliary plan correctly, but the projection lines used were not always sharp and thin. Some other candidates did not show the projection lines at all.

A significant number of candidates started drawing the projection lines at the correct angle, but then could not proceed any further and sketched the auxiliary plan freehand without affecting the necessary transfer of measurements (widths) from the given plan.

Questions on auxiliary views still confuse a large number of candidates. It is disappointing to note that some candidates even mistook this question for an exercise in isometric or oblique drawing.

Distribution of marks for Question 6

	0 marks	1-8 marks	9-15 marks	Full 16 marks
Paper 2A	1.4%	23%	55.2%	20.4%
Paper 2B	4.3%	56.9%	37.4%	1.4%

Question 7- Curve of intersection/surface development

This question featured a thin sheet metal helmet having a cylindrical main body and a conical top. A cut-out in the cylindrical portion was replaced with a transparent plastic visor. A pictorial, front and plan view of the helmet and visor were given. The candidates were asked to construct:

(i) a half of the end elevation;
(ii) a half surface development of the visor, and
(iii) a half surface development of the truncated conical top (only in paper 2A).

A considerable number of the candidates found difficulty locating the necessary points to help draw the intersection curves and the lower curves required in the end elevation. It was noted, with great disappointment, that some candidates could not even draw the top conical part of the end elevation. This in fact turned out to be identical to the same corresponding part of the front elevation.
Regarding the development of the visor, some candidates simply copied its outline shape as given in the front elevation, without realising that it was actually cylindrical, and as such the length of half its development should be derived from the relevant part of the circumference of the cylinder as given in the plan.

For candidates sitting paper 2A, a half development of the helmet top was also requested. The helmet top consisted of a truncated right cone with the cut being parallel to the base and at right angles to the axis. What should have been a basic straightforward exercise, in fact turned out to be difficult for many candidates. The majority failed to realise that the true lengths required to draw the requested radial development could actually be readily collected from the slanted height of the given front elevation. Many instead erroneously used the radius of the base of the cone as the true length.

Distribution of marks for Question 7

	0 marks	**1-9 marks**	**10-17 marks**	**Full 18 marks**
Paper 2A	0.8%	51.1%	44.2%	3.9%
Paper 2B	7.7%	64.1%	26.3%	1.9%

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