L-Università ta' Malta

MATSEC
Examinations Board

Examiners' Report

AM Graphical Communication

First Session 2021

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A. STATISTICAL INFORMATION

The total number of candidates who registered to sit for Graphical Communication was 31.

Table 1 shows the distribution of grades for the Main 2021 session of the examination.

GRADE	A	B	C	D	E	F	ABS	TOTAL
NO. OF CANDIDATES	2	5	4	7	5	8	0	31
% OF TOTAL	6.5	16.1	12.9	22.6	16.1	25.8	0.0	100.0

Table 1: Distribution of grades for Graphical Communication 2021, First Session

B. GENERAL REMARKS

Approximately one third of the candidates performed adequately in this examination. The other third managed to attain a passable mark with the contribution of the CAD portfolio. The average mark of the CAD portfolio was 16.4 / 20 marks. The other third of the candidates' performance was very poor, especially in Paper 1. Most of these candidates copied the drawings and figures given in Paper 1 without progressing any further. In general, most of the candidates' performance in Paper 2 was better.

C. COMMENTS ON PAPER 1

The candidates were asked to attempt five questions from the eight presented.

Question 1: Traces of planes (20 marks)

A pictorial illustration and two orthographic views of a cube with an elliptical hole were given. The traces of the oblique plane, which cut the upper portion of the machined cube, were also given.

The candidates were asked to copy the given orthographic views and project an auxiliary elevation to determine the true inclination of the oblique plane to the horizontal plane. In the first auxiliary elevation the oblique plane will be represented as a section plane. They were also asked to complete the given drawings, by showing how the front elevation and the plan appear after being sectioned by the oblique plane. Finally, the candidates were asked to project the true shape of cut by constructing a second auxiliary view projected from the first auxiliary elevation.

Most candidates attempted this question. The average mark was 10.5 / 20. Only a few candidates' attempt to present a completely correct solution was successful. Other candidates lost marks for the following reasons:

- Some candidates only managed to copy the given views, which included the construction of an ellipse, attaining 5 marks only.
- Some other candidates tried to project an auxiliary view from the front elevation instead from the plan.

- Other candidates' attempt to determine by construction, the true inclination of the cutting plane was unsuccessful.
- Some candidates' attempt to convert the oblique plane into an inclined plane was successful but the subsequent steps were not included.
- Only a few candidates constructed the front elevation correctly.
- Responses indicate that most of the candidates were unfamiliar with the method of constructing a second auxiliary view.
- Other candidates projected the second auxiliary at an angle, which was not perpendicular to the cutting plane.

1 to 9 Marks	10 to 19 Marks	Full Marks	Not Attempted
16	9	3	3

Candidates' performance in question 1

Question 2. Conics (20 marks)

A pictorial illustration and a front elevation of a right cone, truncated by an inclined plane, were given. Two focal spheres, tangential to the cutting plane and to the sides of the cone, were also given. The larger focal sphere was also resting on the base of the cone. The candidates were asked to construct the front elevation by drawing the base, the lower sphere (Ø132), and construct two tangent lines from each endpoint of the base tangential to the Ø132 sphere. These two tangent lines represent the extreme generators of the cone, and their intersection would determine the position of the apex. The smaller focal sphere (Ø38) was expected to be constructed at the upper part of the cone, tangential to the extreme generators. The cutting plane was expected to be constructed tangential to both focal spheres.

The candidates were asked to name the conic section resulting from the truncation. They were also asked to locate by construction, the vertices, the foci and the directices. The candidates were asked to state the ratio of eccentricity and to construct the conic section (ellipse) by using the locus of a point method.

About a third of the candidates attempted this question. Their average mark was 5.7 / 20. No candidate managed to attain full marks in this question. Marks were deducted for the following reasons:

- Some candidates' performance in the geometric construction was insufficient. Only to copy (without constructing tangents) of the given drawing was done.
- Other candidates' attempt to construct the necessary tangents was inadequate since the final steps were missing.
- Less than half of the candidates who attempted this question stated the name of the conic section (ellipse). However, some candidates outlined names, which were not related to conic sections.
- Only a few candidates managed to present a correct solution by locating the vertices, the foci and the directrices. These candidates also managed to state the ratio of eccentricity and construct the ellipse by using the locus of a point method.

1 to 9 Marks	10 to 19 Marks	Full Marks	Not Attempted
11	3	0	17

Question 3. Interpenetration (20 marks)

A three-dimensional illustration and two orthographic views of a modern outdoor fireplace were given. The fireplace consisted mainly of a right cone interpenetrated by a cylinder at an angle of 30° to the vertical plane to produce an oval hole. The cone was also truncated at the top (vent hole) by a horizontal cutting plane, and at the sides, by means of four vertical cutting planes to produce the legs of the fireplace. Candidates were asked to copy the orthographic views and determine the curves of intersection between the 3D geometric forms.

More than half of the candidates attempted this question. The average mark was 3.9 / 20. The highest mark was 7 / 20. Marks were deducted for the following reasons:

- Responses indicate that no candidate realised that when a cone is cut by a vertical cutting plane, a hyperbola is generated. Instead, some of the candidates who tried to answer this sub question drew an arc.
- Several candidates drew the given views without progressing any further.
- Some candidates attempted to use the auxiliary method to determine the curves of intersection. However, the subsequent steps were missing.
- Some candidates attempted to project an auxiliary elevation instead of an auxiliary plan.
- Other candidates' performance was inadequate, as they drew the curves of intersection in a freehand manner without using any constructions.

1 to 9 Marks	10 to 19 Marks	Full Marks	Not Attempted
17	0	0	14

Question 4. First and Second Auxiliary Views (20 marks)

An illustration and two orthographic views of a machined component were given. One of the faces of the component (labelled 'S') was sloping in an oblique manner. The candidates were asked to project a first and a second auxiliary view in order the determine the true shape of the oblique facet.

This question was attempted by more than two thirds of the candidates. The highest mark was 18 / 20, and the average mark was 7.3 / 20. Marks were deducted for the following reasons:

- Several candidates drew the given views without progressing any further.
- A few candidates' attempt to draw a planometric view of the component was inadequate.
- Some candidates' attempt to project part of the first auxiliary view was sufficient, but the attempt to draw the slope was inadequate. Consequently, the second auxiliary view, could not be projected.
- Some other candidates completed the first auxiliary view correctly. However, responses indicate that their attempt to project the second auxiliary was inadequate.
- Some candidates tried to project the second auxiliary directly from the plan instead of projecting from the first auxiliary.

1 to 9 Marks	10 to 19 Marks	Full Marks	Not Attempted
7	16	0	8

Question 5. Cycloidal Curves (20 marks)

An illustration of a rotary pump lobe, two generating circles and a directing circle were given. The profile of the lobe had to be produced by constructing an epicycloid and a hypocycloid and reflecting the curves to form the required outline. Nearly half of the candidates attempted this question. The highest mark was 19 / 20, and the average mark was 11.7 / 20. Quite a few candidates performed very well in this question. Marks were deducted for the following reasons:

- Some candidates drew the given views without progressing any further.
- Other candidates produced the curves freehand with minimum constructions.
- Some candidates' attempt to construct the epicycloid and hypocycloid was adequate. However, the attempt to complete the curves was insufficient as some steps were missing.
- Some candidates misplaced points P_1 and P_2. This lead to completely different curves than requested.
- Several candidates successfully constructed the curves and their reflections. However, these constructions were done in a rough and inaccurate manner. This resulted in inaccurate plotting and blending of the curves.
- The candidates were asked to give the technical names of the generated curves. Only a few candidates gave the correct answers. Some candidates did not name the curves.

1 to 9 Marks	10 to 19 Marks	Full Marks	Not Attempted
7	9	0	15

Question 6. Transition Piece (20 marks)

An illustration and two orthographic views of an elliptical-to-elliptical transition piece were given. The candidates were asked to copy the given orthographic views, determine the crease lines in both views and construct their true lengths. They were also asked to construct the true shape of the upper opening and finally construct a half surface development of the transition piece.

About half of the candidates attempted this question. The highest mark was 18 / 20, and the average mark was 6.6 / 20. Marks were deducted for the following reasons:

- More than half of the candidates who attempted this question copied the given orthographic views only. A number of these candidates' attempt to construct the ellipse was inadequate. Some candidates outlined the ellipse in a very rough manner while others drew the ellipse freehand, without any constructions.
- Responses indicate that only a few candidates realised that the true shape of the upper opening of the transition piece, was elliptical. Some candidates constructed the development by using the circumference of the Ø56 circle instead of the 80 mm x 56 mm ellipse.
- Some candidates' performance was insufficient as the crease lines in the front elevation and in the plan were not included.
- Most of the candidates' attempt to construct the true lengths properly was inadequate.

1 to 9 Marks	10 to 19 Marks	Full Marks	Not Attempted
13	3	0	15

Question 7. Radial Arm Disc Cam (20 marks)

A 3D illustration of a radial arm disc cam was given. Details of the cam data, the radial arm, the roller follower, and the cam centre were also given. The candidates were asked to copy the given two-dimensional figure, construct the displacement diagram, and lay out the cam profile.

This question was answered by about two thirds of the candidates. The highest mark was 17 / 20, and the average mark was 11 / 20. More than half of the candidates attained more than 10 marks in this question. Marks were deducted for the following reasons:

- Some candidates drew the given views without progressing any further.
- Most of the other candidates constructed the follower displacement correctly. However, in many cases this was not aligned correctly with the oscillating arm.
- Some of the candidates did not progress any further than the follower displacement diagram.
- Almost all the candidates who attempted to construct the profile of the cam ignored the fact that the follower was of the oscillating radial arm type and approached the problem as if the follower was of the vertical in-line type. This resulted in an erroneous profile of the cam.

1 to 9 Marks	10 to 19 Marks	Full Marks	Not Attempted
8	13	0	10

Question 8. Involute Spur Gears in Mesh (20 marks)

The candidates were given an illustration of two identical involute spur gears (gear 'A' and gear 'B') in mesh. They were also given the necessary data and figure to be able to construct two teeth of gear 'A' and three teeth of gear 'B'.

About one third of the candidates attempted this question. Half of these candidates attained full marks in this question. The average mark was 13.2 / 20. Marks were deducted for the following reasons:

- Most of the candidates, who attempted this question, performed well in the gear data calculations. However, some candidates found difficulty to proceed further.
- Some candidates attempted to draw the teeth profiles without constructing the involute on the base circle.
- Some candidates' attempt to draw the gear teeth was insufficient as it was done very roughly.
- Some candidates left a large gap between the supposedly meshing teeth.
- A few other candidates' performance was inadequate, since the meshing teeth were not constructed touching at the pitch point.

1 to 9 Marks	10 to 19 Marks	Full Marks	Not Attempted
3	2	5	21

D. COMMENTS ON PAPER 2

The candidates were asked to attempt four questions.

Question 1. Two-point perspective drawing (34 marks)

This question dealt with a two-point perspective drawing of a mobile sales and repair shop. Three orthographic views of this shop, together with two isometric drawings of furniture items were given. Candidates had to use the supplied drawing information to construct the 2-point estimated perspective drawing of the whole area. Most of the candidates did well in this question. The average mark was 21.5 / 34 marks. The highest mark was 31 / 34 marks.

The following are the examiners' observations about candidates' shortcomings when dealing with this question. Marks were deducted mainly due to the following reasons:

- Some candidates' attempt to produce a good, estimated perspective crate that made use of most of the A2 space sheet was inadequate. This resulted in disproportionate drawings that were either generally too small or too narrow.
- Repeated sketches that did not explore different viewpoints.
- The ceiling lighting being left out entirely or not drawn correctly.
- Lines not converging at vanishing points.
- The inside of cabinets being entirely left out.
- The haphazard rendering of items.

1 to 15 Marks	16 to 30 Marks	31 to 34 Marks	Not Attempted
5	24	1	1

Question 2. Graphical Instruction Leaflet Design (22 marks)

This question dealt with the graphical representation of the sequential operation of a pod coffee machine. Candidates had to graphically interpret eight consecutive written steps after exploring the best way to do so through preparatory sketching. Eighteen candidates attempted this question, and the average mark was 14 / 22 marks. The highest mark was 19 / 22 marks.

The following are the examiners' observations about the candidates' shortcomings when dealing with this question. Marks were deducted mainly due to the following:

- Not enough preparatory sketches being drawn or left out completely.
- The attempt to re-write the given steps on the graphical representations was insufficient.
- Rough and haphazard sketches being presented instead of well-proportioned and executed freehand drawings in the presentation section.
- Certain steps being entirely left out.

1 to 10 Marks	11 to 21 Marks	Full Marks	Not Attempted
3	15	0	13

Question 3. Freehand Pictorial Sketch (22 marks)

This question dealt with the freehand pictorial representation of a paper puncher. Four orthographic views were given to convey information about the various parts of this puncher. Candidates were expected to explore various viewpoints through two preparatory sketches and then proceed to draw a well-proportioned pictorial view of this puncher, including its rendering in colour. Twenty-seven candidates attempted this question, the highest mark was 18 / 22 marks. The average mark was 12 / 22 marks. The following are the examiners' observations about candidates' shortcomings when dealing with this question. Marks were deducted mainly due to the following:

- Preparatory sketches being left out completely.
- The same sketch being repeated with no exploration of a different viewpoint.
- Choosing viewpoints that hid important parts of the drawing, such as the resting pads, the upright guides, and the blades.
- Using instruments instead of freehand drawing.
- The disproportionate and unscaled representation of the various parts of the puncher.
- Careless and haphazard execution of colour that ignored both material and texture.
- Missing arrows to explain the mechanical operation of the puncher.

1 to 10 Marks	11 to 21 Marks	Full Marks	Not Attempted
6	21	0	4

Question 4. Airline Company Logo (22 marks)

This question dealt with the creation and representation of an aeroplane company logo on the stabilizer and rudder of the company's planes. Candidates had to explore various graphical possibilities towards this end. Candidates were also expected to include the name of the said company; 'Bullet-Air International', in the space provided together with the proposed logo. The final realisation of the entire design had to include colour and shading. Twenty-six candidates attempted this question, The highest mark was 18 / 22 marks, and the average mark was 13 / 22 marks.

The following are the examiners' observations regarding candidates' shortcomings when dealing with this question. Marks were deducted mainly due to the following:

- Poor, missing, or repeated preparatory sketches.
- Inefficient use of drawing space.
- Not including the name of the airlines on the stabilizer or rudder.
- Poor use of line drawing.
- Haphazard colour and shading.

1 to 10 Marks	11 to 21 Marks	Full Marks	Not Attempted
7	19	0	5

Question 5. Shaded two-dimensional freehand sketch (22 marks)

This question dealt with a two-dimensional representation of one of the faces of a cordless drill. Colour and shading were expected to be used to express the idea of volume and to render the different materials composing the drill. Nineteen candidates attempted this question. The highest mark was 18 / 22 marks, and the average mark was 9 / 22 marks. The following are the examiners' observations regarding candidates' shortcomings when dealing with this question. Marks were deducted mainly due to the following:

- Parts being drawn disproportionately to one another.
- Line drawing not being up to standard, even when horizontal and vertical lines were involved.
- Missing detail on the body and grip of the cordless drill.
- Poor colouring and shading.

1 to 10 Marks	11 to 21 Marks	Full Marks	Not Attempted
12	7	0	12

Chairperson
Examiners Panel 2021