



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2019

Marking Scheme

Design and Communication Graphics

Higher Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.



Coimisiún na Scrúduithe Stáit
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Leaving Certificate Examination 2019

Design and Communication Graphics Higher Level



Marking Scheme and Sample Solutions

(Other valid solutions are acceptable and are marked accordingly)

QUESTION A-1**MARKS****(a) Dihedral angle (12)**

- (i) X_1Y_1 parallel to line of intersection 'bc'2
- (ii) Projections perp. to X_1Y_1 1
- (iii) Draw planes 'abc' and 'bcd' in 1st auxiliary view3
- (iv) X_2Y_2 perp. to line of intersection1
- (v) Projections perp. to X_2Y_2 1
- (vi) Location of points on planes 'abc' and 'bcd' in 2nd auxiliary3
- (vii) Determination of required dihedral angle1

(b) Determination of H.L. on surface 'cdp' and inclination to V.P. (8)

- (viii) Draw required Horizontal Line in elevation1
- (ix) Draw required Horizontal Line in plan2
- (x) Determination and indication of required angle in plan ... (1,4).....5

Total = 20

QUESTION A-2**MARKS****(a) Location of Vertex and additional points (16)**

- (i) Location of vertex3
- (ii) Location of 3 points outside Latus Rectum6
- (iii) Location of 2 points inside Latus Rectum4
- (iv) Draw curve (any = 1)3

(b) Tangential Circle (4)

- (v) Draw normal perp. to eccentricity line at P1
- (vi) Bisect angle between eccentricity line and directrix to locate centre1
- (vii) Draw required circle2

Total = 20

QUESTION A-3**MARKS****(a) Completion of projections (16)**

- (i) Location of penetration points on LHS3
- (ii) Completion of elevation on LHS incl. hidden detail3
- (iii) Location of top and bottom penetration points on RHS3
- (iv) Use of appropriate method to determine 'crossover' points2
- (v) Location of two required crossover points2
- (vi) Completion of plan on RHS incl. hidden detail3

(b) Draw true shape of triangle 'abc' (4)

- (vii) Use of appropriate method to determine true shape1
- (viii) Drawing of required True Shape3

Total = 20
QUESTION A-4**MARKS****(a) Perspective Projection of Pitch (17)**

- (i) Perspective of Left-hand Side-line 5
- (ii) Perspective Projection of 20m and 13m lines6
- (iii) Perspective Projection of large 'rectangle'3
- (iv) Perspective Projection of small 'square/rectangle'3

(b) Height of Goalpost Upright (3)

- (v) Extension of top of goalpost upright to PP and GL1
- (vi) Construction and establish required height2

Total = 20

QUESTION B-1**MARKS**

- (a) **Axonometric axes and isosceles triangle (8)**
- (i) Draw axonometric axes X, Y and Z orientated as shown3
- (ii) Draw required isosceles triangle 'abc'5
- (b) **Plan and Elevation as shown (12)**
- (iii) Correct development of XZ plane in required orientation3
- (iv) Draw plan as given3
- (v) Correct development of XY plane in required orientation3
- (vi) Draw elevation as given3
- (c) **Complete axonometric projection as given (4)**
- (vii) Projections from elevation and plan1
- (viii) Draw given axonometric projection (as presented).....3
- (d) **Complete axonometric projection (21)**
- (ix) Establish 4 other vertical rectangular surfaces ... (4 x 1)4
- (x) Draw 4 inclined connecting lines on RHS of package in axon. projection.....2
- (xi) Establish extreme midpoint on LHS in axon. projection5
- (xii) Complete middle section of axon. projection7
- (xiii) Complete top surface (3 lines)3

Total = 45

QUESTION B-2**MARKS****(a) Elevation as given (16)**

- (i) Establish required rectangular outline for curve **ABC**3
- (ii) Construction to locate points on parabola **ABC** in elevation7
- (iii) Draw Curve ... (Any = 1)3
- (iv) Vertical 'tension cables'3

(b) Draw given plan (24)

- (v) Establish required rectangular outline for curve **DEF**2
- (vi) Construction to determine points on upper half of LH hyperbola as given4
- (vii) Mirror to lower half2
- (viii) Draw Curve ... (Any = 1)3
- (ix) Mirror curve to RHS2
- (x) Draw Curve1
- (xi) Draw central roadway (incl hidden detail)3
- (xii) Draw Line GH and three corresponding lines3
- (xiii) Construction to establish centres for arcs2
- (xiv) Draw required arcs and complete plan2

(c) Tangent to Parabola (5)

- (xv) Locate focus1
- (xvi) Construction to determine tangent2
- (xvii) Draw required tangent2

Total = 45

QUESTION B-3**MARKS**

- (a) **Plan and Elevation of intersecting planes (12)**
- (i) Establish coordinates of planes A and B in plan 2
- (ii) Plan of intersecting planes 5
- (iii) Elevation of intersecting planes 5
- (b) **Dihedral Angle (16)**
- (iv) X_1Y_1 parallel to line of intersection 3
- (v) Projection of planes and line of intersection on new X_1Y_1 3
- (vi) New X_2Y_2 perpendicular to line of intersection 5
- (vii) Projection of planes as lines and indicating dihedral angle 5
- (c) **Inclination of surface A to HP (6)**
- (viii) Projection of plane A onto given X_1Y_1 2
- (ix) Determine and indicate inclination of surface A to HP 4
- (d) **Intersection points with line PQ (11)**
- (x) Draw projections of line PQ 3
- (xi) Construction to establish penetration points 8

Total = 45

QUESTION C-1**MARKS****(a) Earthworks on curved portion of track (30)*****Earthworks on curved section between A and B (Level) - Embankment***

- (i) Draw parallel arcs at 10mm intervals4
- (ii) Identify intersections with contours and draw curves3

Earthworks on curved section between A and B (Level) - Cutting

- (iii) Draw parallel arcs at 5mm intervals4
- (iv) Identify intersections with contours and draw curves3

Earthworks between G and F (Level) - Embankment

- (v) Draw parallel lines at 10mm intervals4
- (vi) Identify intersections with contours and draw curve3

Earthworks on southern side between B and C (rising embankment)

- (vii) Draw required 10mm arc at C and draw tangent2
- (viii) Draw parallel lines at 10mm intervals2
- (ix) Identify intersections with contours and draw curve2

Earthworks on northern side between F and E (rising embankment)

- (x) Draw required 10mm arc at E and draw tangent1
- (xi) Draw parallel lines at 10mm intervals1
- (xii) Identify intersections with contours and draw curve1

(b) Dip of stratum, altitude of P and required true angle (15)

- (xiii) Projections perp. to X_1Y_1 2
- (xiv) Locate points Q and R in auxiliary view2
- (xv) Establish required dip angle3
- (xvi) Locate height of point P3
- (xvii) Draw required triangle PQR in elevation ... (3×1)3
- (xviii) Determine the true angle between the line PR and the strike line S2

Total = 45

QUESTION C-2**MARKS**

- (a) **Draw required elevation of hyperbolic paraboloid structure (13)**
- (i) Draw required rectangle for construction of parabola in elevation4
 - (ii) Required construction to determine points on parabola in elevation.....4
 - (iii) Draw parabolic curve in elevation (Any = 1)3
 - (iv) Completion of elevation2
- (b) **End view of generating Parabola (10)**
- (v) Establish required rectangular outline for curve ABC.....3
 - (vi) Construction to locate points on required parabola4
 - (vii) Draw parabolic curve (Any = 1)3
- (c) **Plan of structure (18)**
- (viii) Locate points D, F, A & C4
 - (ix) Establish widths on curves on LHS in plan6
 - (x) Draw correct curves on LHS in plan (Any = 1)3
 - (xi) Establish widths on curve on RHS in plan.....2
 - (xii) Draw curve on RHS in plan (Any = 1)3
- (d) **Vertical distance between line PQ and point R (4)**
- (xiii) Draw line PQ in elevation and plan2
 - (xiv) Construction to determine required vertical distance2

Total = 45

QUESTION C-3**MARKS****(a) Elevation, Plan and End View (15)**

- (i) Draw elevation as given .. (5×1) 5
- (ii) Draw plan as given 5
- (iii) Draw end view as given 5

(b) Dihedral angle between surfaces A and B (12)

- (iv) X_1Y_1 parallel to line of intersection 3
- (v) Projection of surfaces A and B and line of intersection on new X_1Y_1 3
- (vi) New X_2Y_2 perpendicular to line of intersection 3
- (vii) Projection of surfaces as lines and indicating dihedral angle 3

(c) Development of Surfaces C and B (7)

- (viii) Correct construction to determine true shape of vertical surface C 2
- (ix) Correct construction to determine true shape of oblique surface B 5

(d) Determine the horizontal and vertical traces of surface B (11)

- (x) Correct identification of required horizontal trace 2
- (xi) Construction to determine point on Vertical Trace 4
- (xii) Draw required Vertical Trace 5

Total = 45

QUESTION C-4**MARKS****(a) Displacement Diagram (23)**

- (i) Horizontal divisions at 15mm as required on displacement diagram3
- (ii) Establish 90mm height at 60° interval and draw UV line3
- (iii) Draw correct horizontal 'Dwell' line2
- (iv) Construction to determine U.A.R. (min. 7 incl. end points) to 30mm9
- (v) Draw UAR curve ... (any = 1)3
- (vi) Draw required UV line to 360°3

(b) Trochoid (22)

- (vii) Draw given circle and line AB3
- (viii) Draw 30° line to contain reflector in starting position2
- (ix) Locate reflector in correct position2
- (x) Locate 12 points on curve (incl. 2 turning points)12
- (xi) Draw required trochoid ... (any = 1)3

Total = 45

QUESTION C-5**MARKS****(a) Sectional Elevation (45)*****Assembly (6)***

- (i) Relative positioning of components.....6

Base (7)

- (ii) Rectangular outline4
 (iii) Upright cylindrical slots.....2
 (iv) Base relief1

Vertical Columns (Ø16) (3)

- (v) Rectangular outlines.....2
 (vi) Circular holes1

Coffee Hopper (6)

- (vii) Draw given section of Coffee Hopper6

Bottom Grinding Disc (2)

- (viii) Draw required outline2

Top Driver Housing and Transparent cover (7)

- (ix) Outline of Top Driver Housing and Transparent Cover4
 (x) Inner Detail3

Top and vertical Spindles (including bushes) (5)

- (xi) Vertical Spindle and Bush2
 (xii) Top Spindle and two bushes3

Friction Cones (2)

- (xiii) Horizontal and Vertical cones.....2

Handle Assembly (3)

- (xiv) Draw required Handle Assembly as given.....3

Completion of drawing

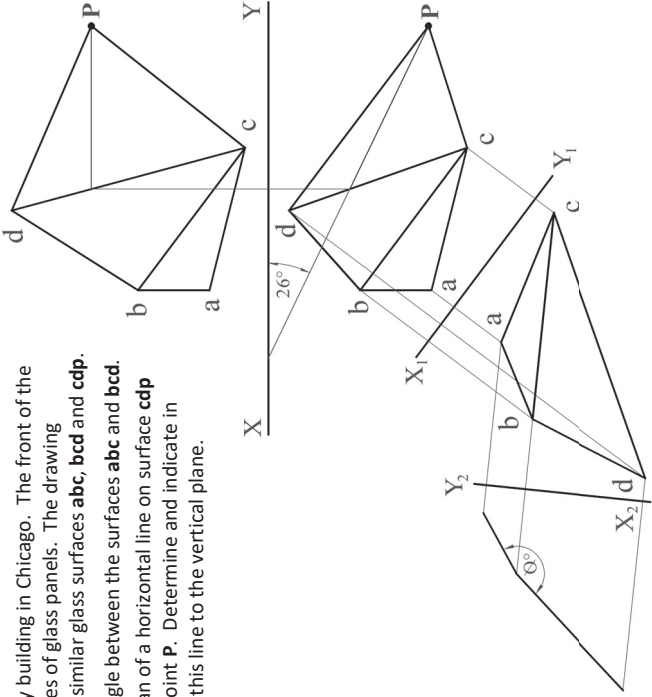
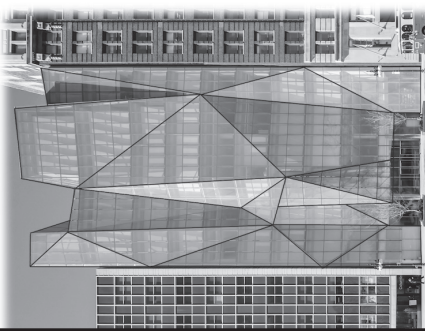
- (xv) Presentation, hatching and centrelines4

Total = 45

SECTION A - Core - Answer any three of the questions on this A3 sheet.

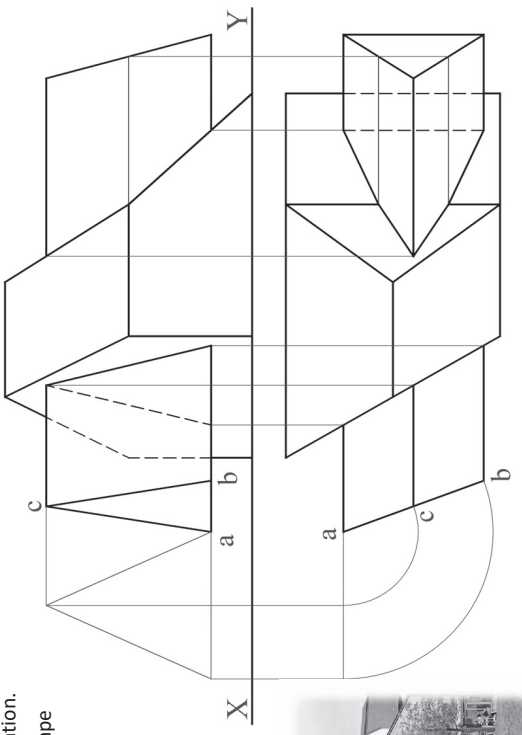
A-1. The image shows a multi-storey building in Chicago. The front of the structure is comprised of a series of glass panels. The drawing shows the projections of three similar glass surfaces **abc**, **bcd** and **cdp**.

- Determine the dihedral angle between the surfaces **abc** and **bcd**.
- Draw the elevation and plan of a horizontal line on surface **cdp** which shall pass through point **P**. Determine and indicate in degrees, the inclination of this line to the vertical plane.



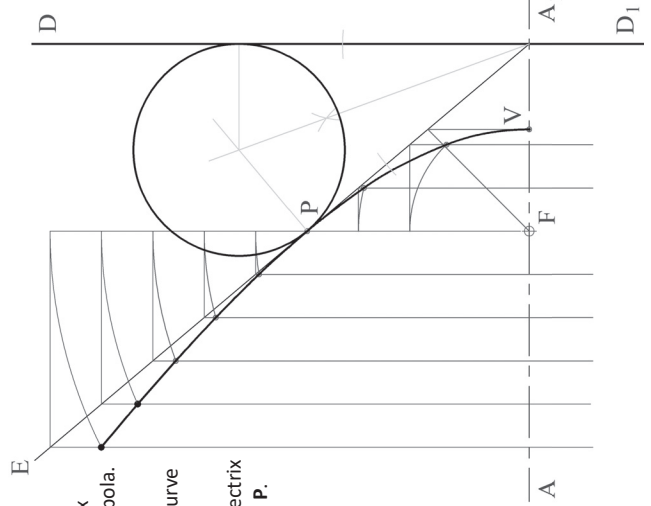
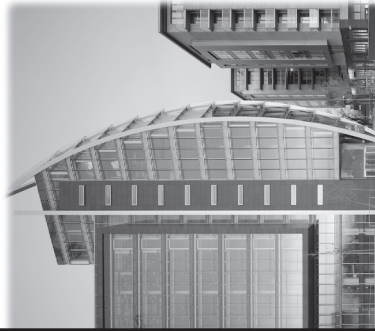
A-3. The image below shows a building which is based on a series of intersecting prisms. The drawing shows the incomplete elevation and plan of two similar prisms which penetrate each other. In the drawing, an irregular pentagonal prism, which has been cut as shown, is intersected by a triangular prism.

- Complete the elevation and plan, showing all lines of interpenetration.
- Determine the true shape of the triangle **abc**.



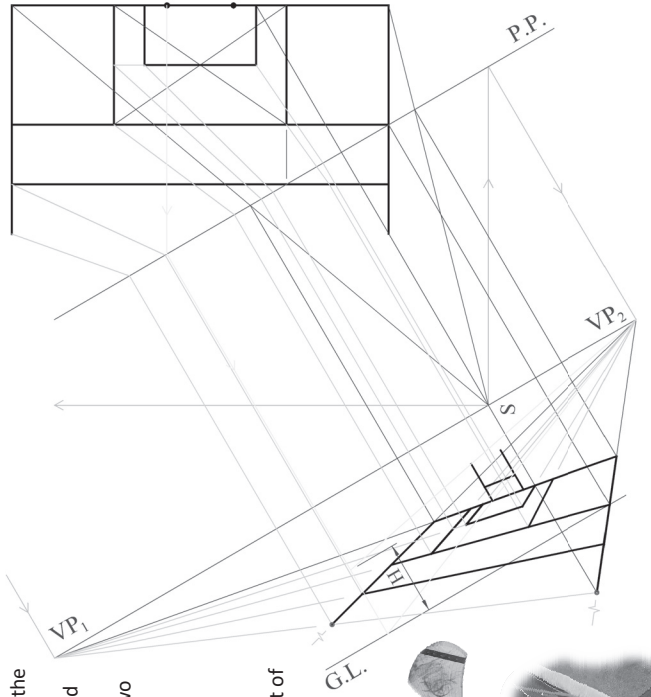
A-2. The image below shows the 'AOL' building in Dublin. The curve at the end of the building is a hyperbola. The drawing on the right shows the axis **AA₁**, directrix **DD₁**, focus **F** and eccentricity line **E** of a similar hyperbola. A number of points on the curve are also given.

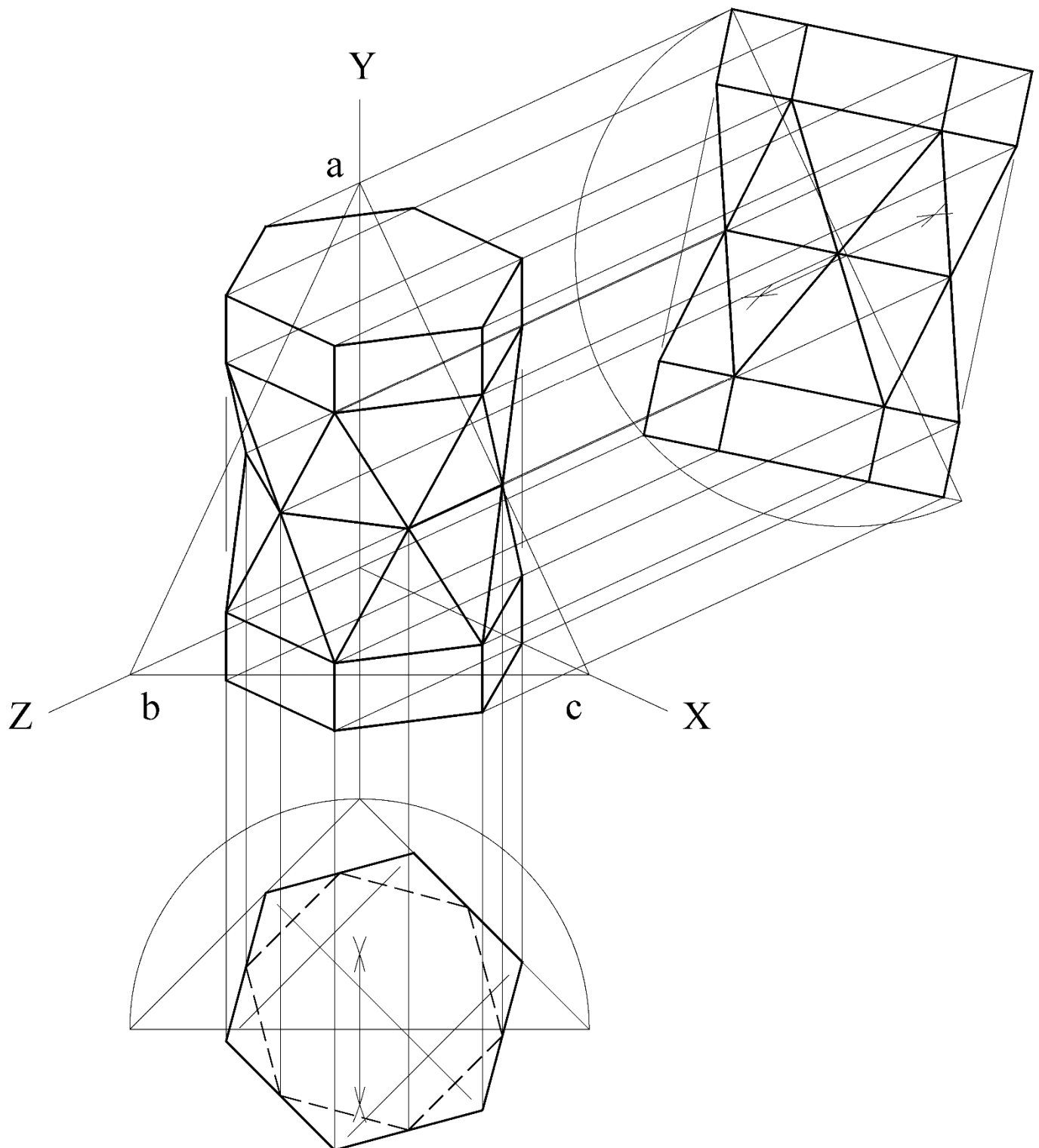
- Locate the vertex, five additional points on the curve and draw the top portion of the hyperbola.
- Draw a circle which shall be tangential to the directrix and also tangential to the hyperbola at the point **P**.

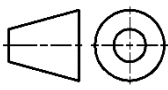


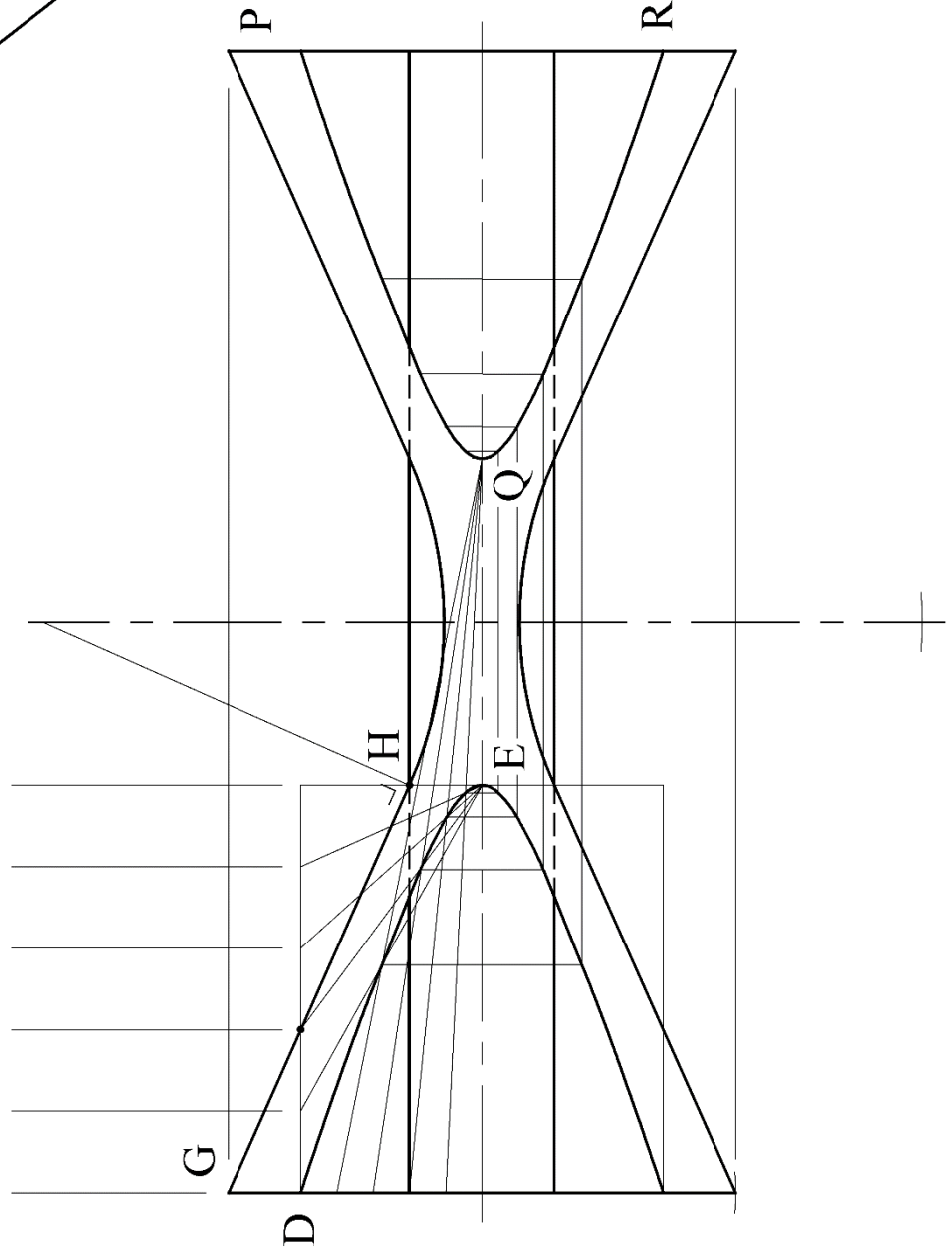
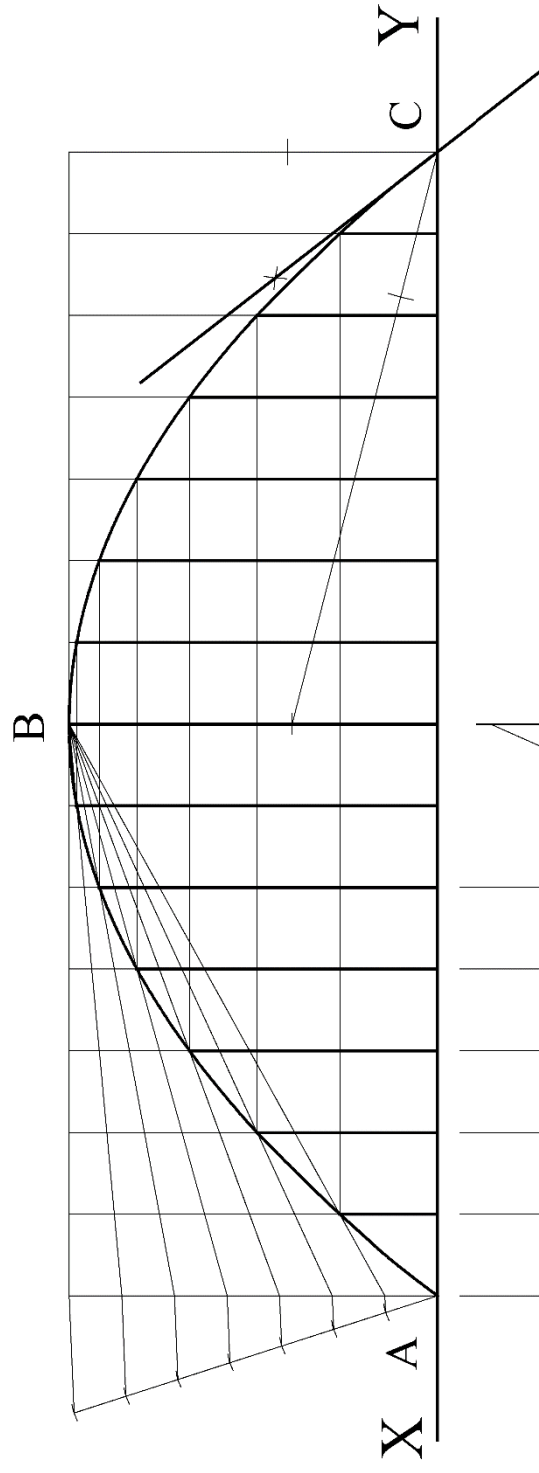
A-4. The drawing on the right shows the plan and a partially completed perspective projection of the end portion of a GAA pitch and goalposts. The position of the two vanishing points are given.

- Complete the perspective projection of the given end portion of the pitch.
- Determine the actual height of the goalpost upright.





Design & Communication Graphics – Higher Level		
	Marking Scheme	
	Question B-1	
	Scale: n/a	June 2019



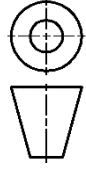
Design & Communication Graphics – Higher Level

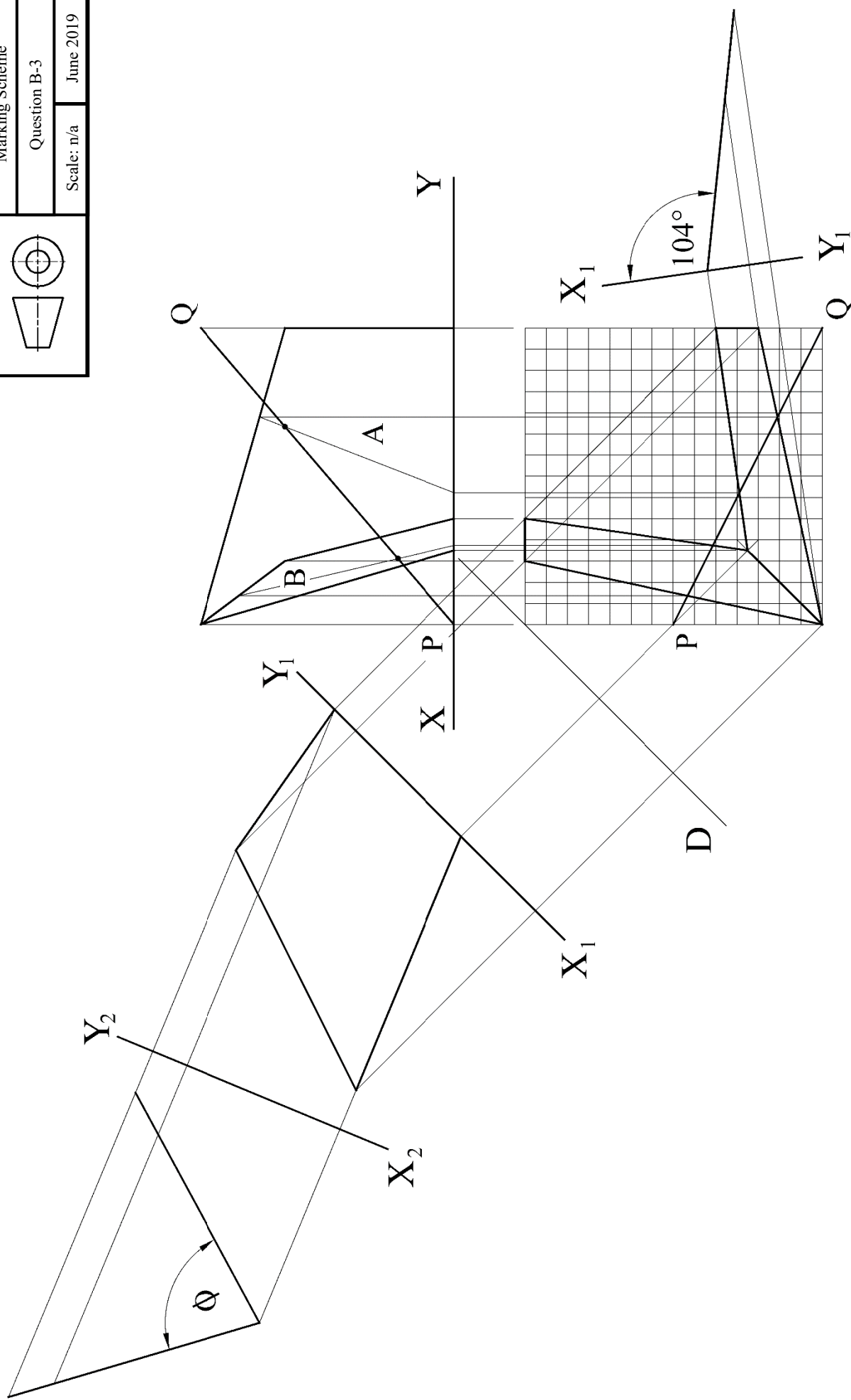
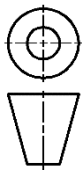
Marking Scheme

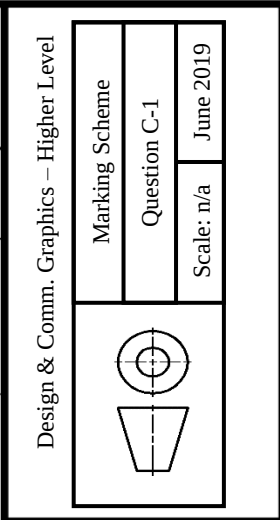
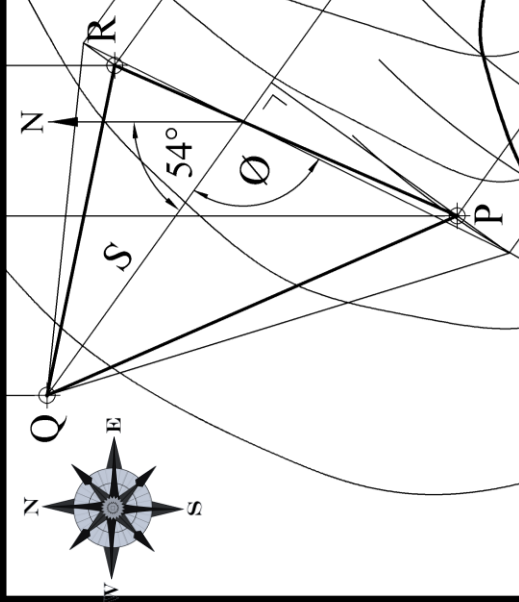
Question B-2

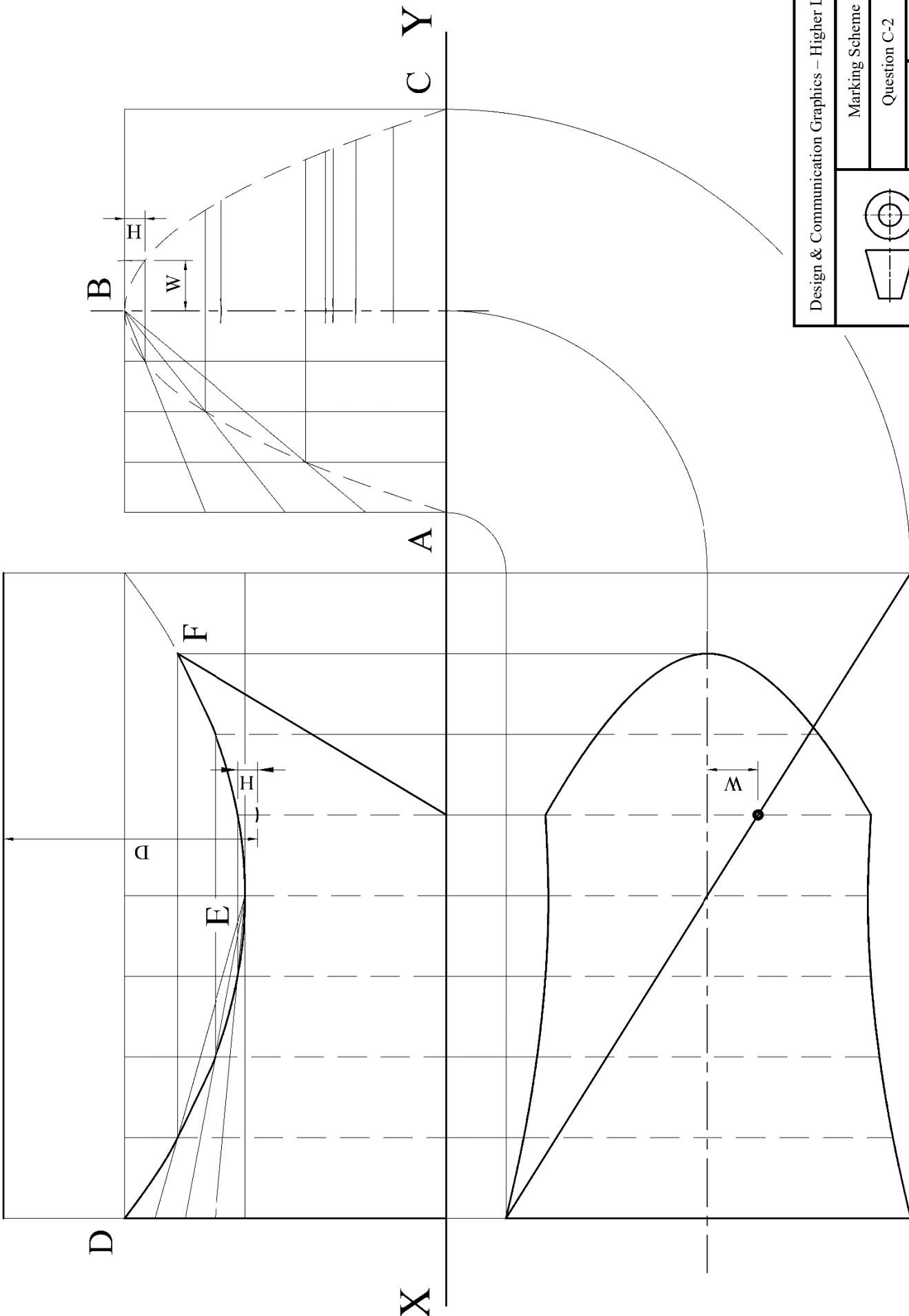
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June 2019

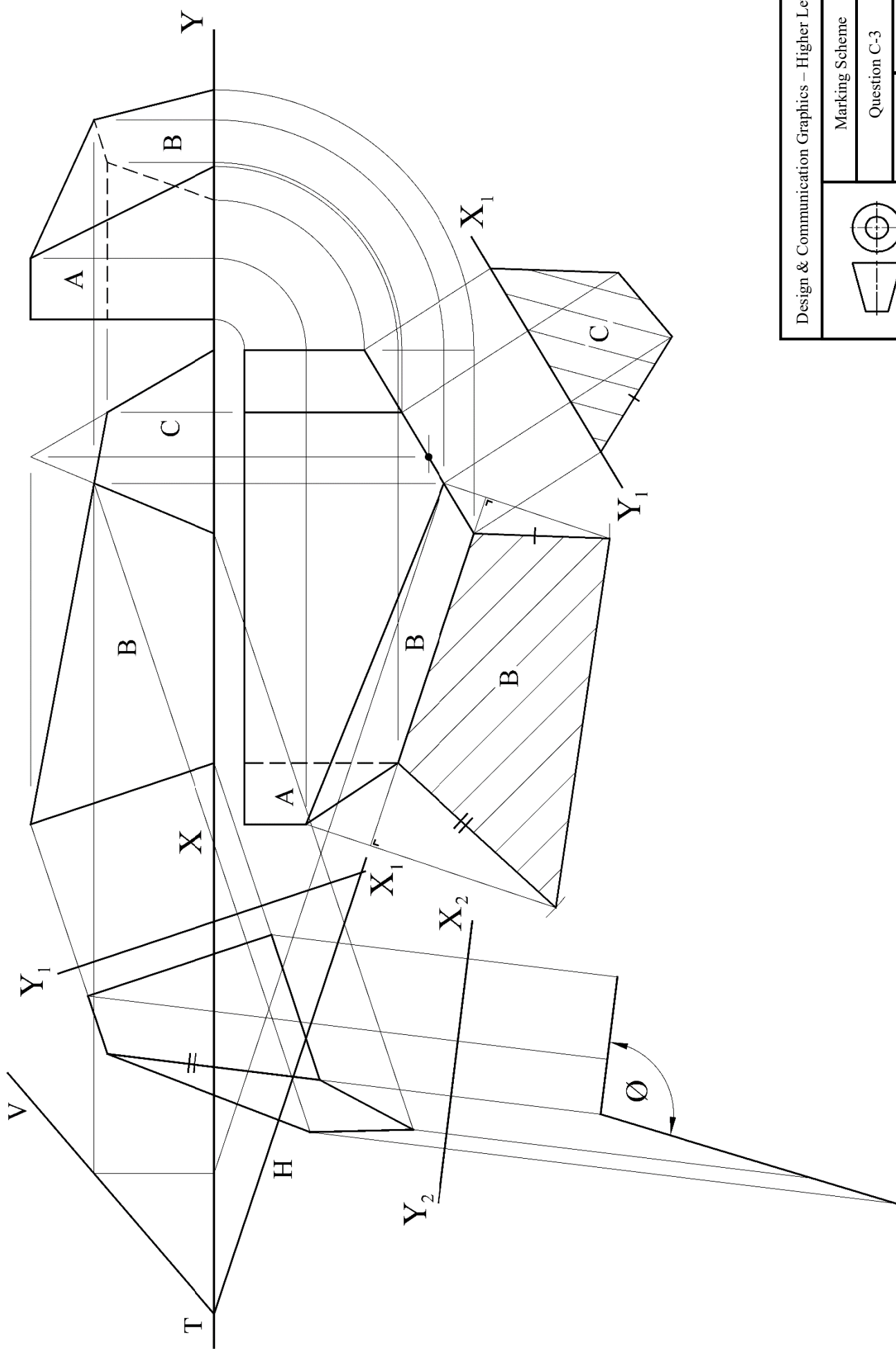








Design & Communication Graphics – Higher Level		
		Marking Scheme
		Question C-2
Scale: n/a	June 2019	

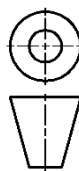


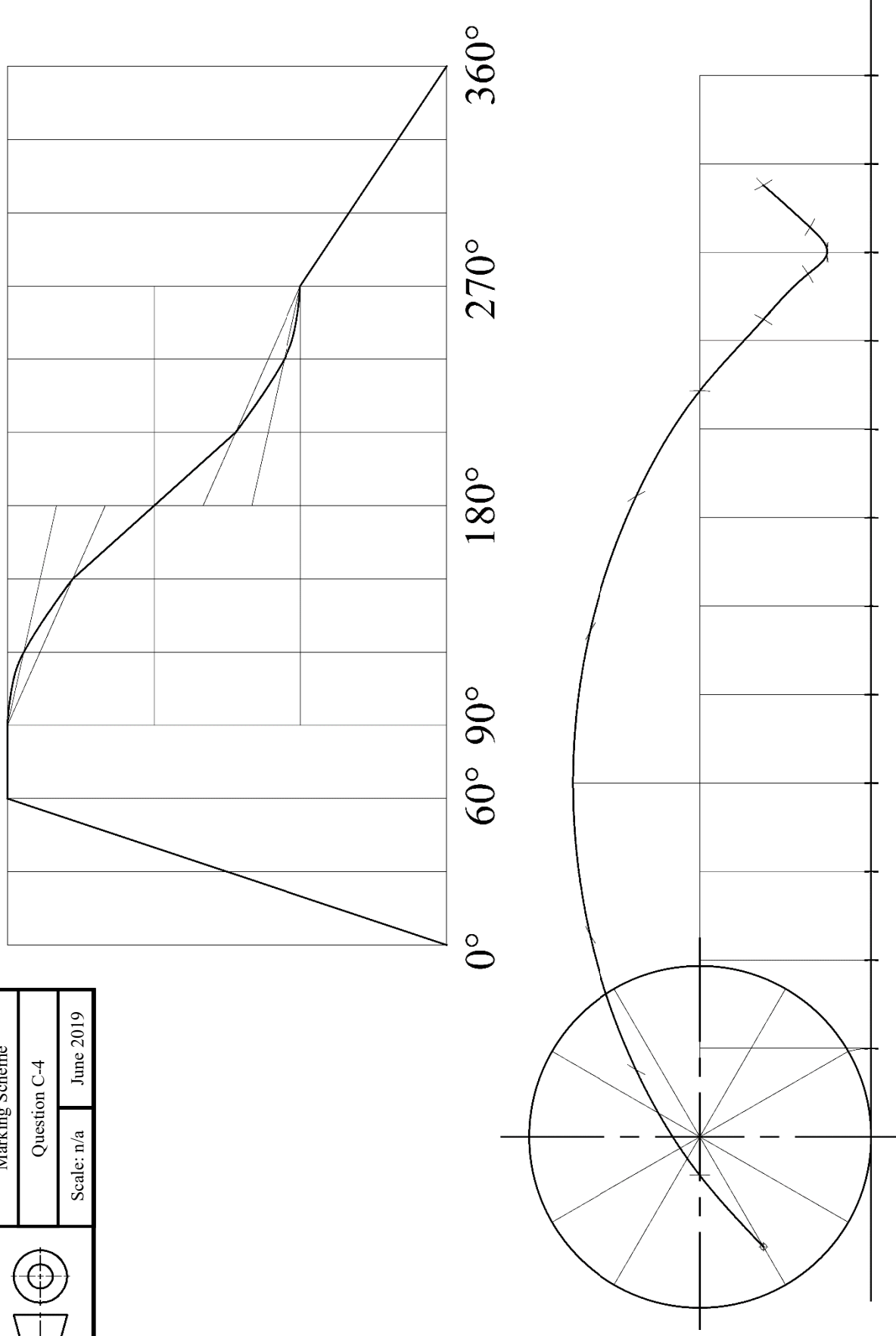
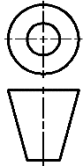
Design & Communication Graphics – Higher Level

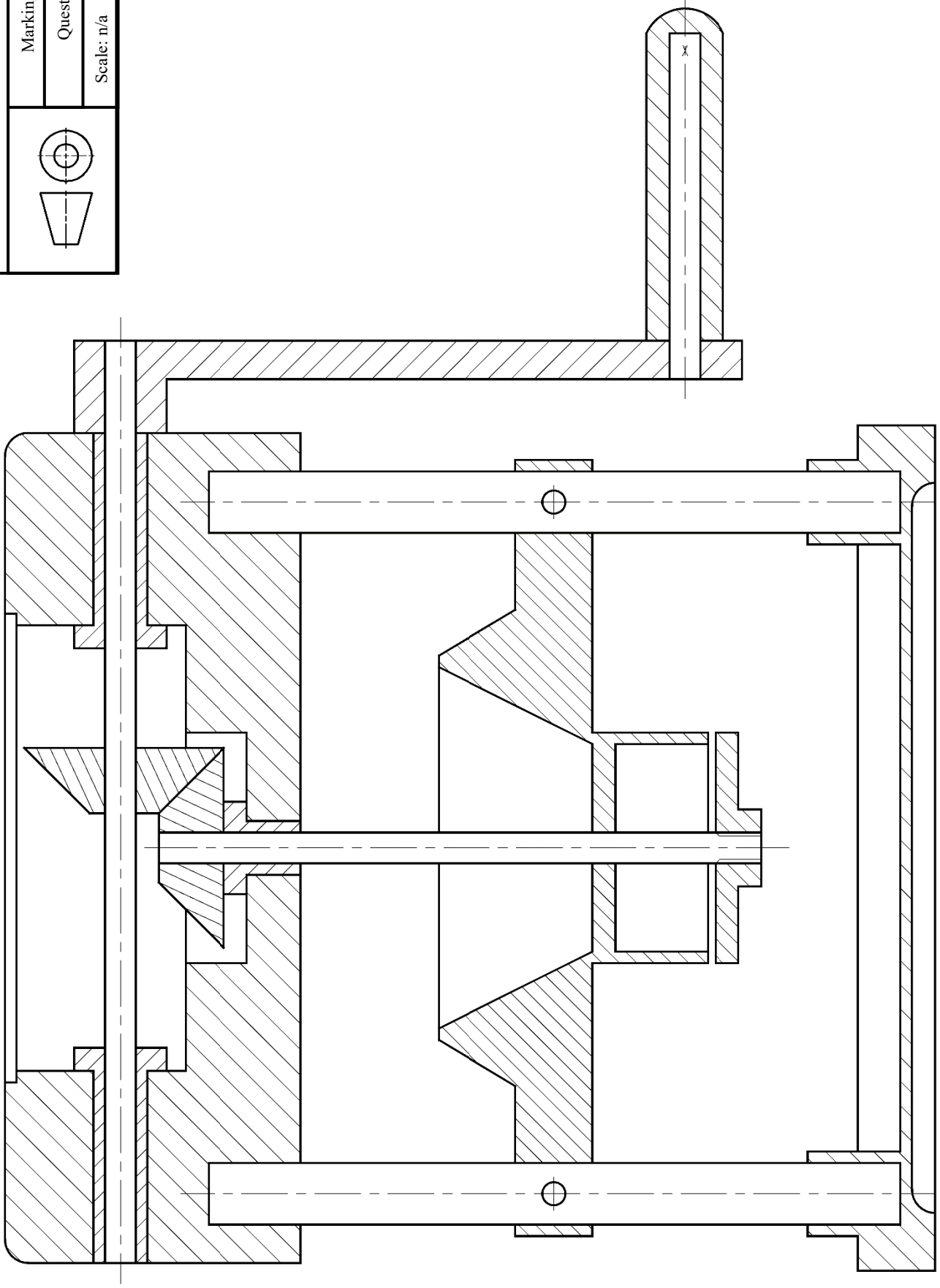
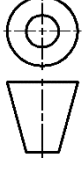
Marking Scheme

Question C-3

Scale: n/a June 2019







Design and Communication Graphics

Student Assignment - Higher Level

Assessment Sheet 2019

Candidate Exam No.

Output	Marking criteria	Marks
1	Design Research - Exploration of main design features using primary & secondary research; Selection of appropriate graphics; Effective layout and presentation of information combining images, sketches & annotations	
	a) Extensive range of relevant criteria considered - excellent presentation	13 - 15
	b) Most relevant criteria considered - very good presentation	10 - 12
	c) Some relevant criteria considered - good presentation	7 - 9
	d) Limited criteria considered - fair presentation	4 - 6
	e) At least one criterion considered - poor presentation	0 - 3
2	Design Feature Comparison - Selection of two appropriate images; Main dimensions inserted; Comparison of main design features; Contrasting of main design features; Effective layout and presentation of information combining images, sketches & annotations	
	a) Extensive range of relevant criteria considered - excellent presentation	13 - 15
	b) Most relevant criteria considered - very good presentation	10 - 12
	c) Some relevant criteria considered - good presentation	7 - 9
	d) Limited criteria considered - fair presentation	4 - 6
	e) At least one criterion considered - poor presentation	0 - 3
3	Freehand Graphical Representation - Proportion; Form/Volume; Use of Tone/Line for effective rendering; Detailed communication of main design features to include 3D presentation quality drawing; Layout & presentation	
	a) Extensive range of relevant criteria considered - excellent presentation	17 - 20
	b) Most relevant criteria considered - very good presentation	13 - 16
	c) Some relevant criteria considered - good presentation	9 - 12
	d) Limited criteria considered - fair presentation	5 - 8
	e) At least one criterion considered - poor presentation	0 - 4
4	SolidWorks Parts, Assembly, Drawing and eDrawing files	
	• Adherence to required filing structure	4
	• Creation of a minimum of 5 Part files	2
	• Part models – Proficiency in Parametric CAD, including economy of design and design intent; Selection of most appropriate profiles; Sketches fully defined; Features renamed; Appropriate type of extrusions/end conditions used	10
	• Assembly – Creation of Assembly environment; Accuracy of parts to facilitate correct assembly; Correct mating of parts; Application of appropriate appearances	5
	• Factor of difficulty	5
5	• eDrawing of CAD model	2
	Hardcopy outputs from SolidWorks - Detailed orthographic views of the selected artefact; Section/Detail views where appropriate; Rendered pictorial view of the Assembly; Exploded view of the CAD model; Inclusion of main dimensions, notes and symbols; Appropriate scaling, layout and presentation to be considered	
	a) Extensive range of relevant criteria considered - excellent presentation	13 - 15
	b) Most relevant criteria considered - very good presentation	10 - 12
	c) Some relevant criteria considered - good presentation	7 - 9
	d) Limited criteria considered - fair presentation	4 - 6
	e) At least one criterion considered - poor presentation	0 - 3
6	Photorealistic Representation	
	Produce photorealistic computer generated images of the artefact	7
7	Graphical exploration of design solutions - Exploration of theme/possible solution(s); Justification of chosen solution(s); Use of appropriate images/graphics; Effective layout and presentation of information combining images, sketches & annotations	
	a) Extensive range of relevant criteria considered - excellent presentation	21 - 25
	b) Most relevant criteria considered - very good presentation	16 - 20
	c) Some relevant criteria considered - good presentation	11 - 15
	d) Limited criteria considered - fair presentation	6 - 10
	e) At least one criterion considered - poor presentation	0 - 5
8	Presentation of Modification/Concept Design - Proportion; Form/Volume; Use of Tone/Line for effective rendering; Detailed communication of modified/concept design features; Layout and presentation	
	a) Extensive range of relevant criteria considered - excellent presentation	9 - 10
	b) Most relevant criteria considered - very good presentation	7 - 8
	c) Some relevant criteria considered - good presentation	5 - 6
	d) Limited criteria considered - fair presentation	3 - 4
	e) At least one criterion considered - poor presentation	0 - 2
9	Hardcopy outputs from SolidWorks - CAD Model; Detailed orthographic views of the proposed solution; Section/Detail views where appropriate; Rendered pictorial view of the CAD model; Photorealistic image; Inclusion of main dimensions, notes and symbols; Appropriate scaling, layout and presentation to be considered	
	• Application of CAD skills	5
	a) Extensive range of relevant criteria considered - excellent presentation	17 - 20
	b) Most relevant criteria considered - very good presentation	13 - 16
	c) Some relevant criteria considered - good presentation	9 - 12
	d) Limited criteria considered - fair presentation	5 - 8
	e) At least one criterion considered - poor presentation	0 - 4
Sub-total		
Marks deducted for pages in excess of maximum		
Total		

