



Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2010

MARKING SCHEME

**DESIGN AND COMMUNICATION
GRAPHICS**

HIGHER LEVEL



STATE EXAMINATIONS COMMISSION

LEAVING CERTIFICATE 2010

**DESIGN & COMMUNICATION GRAPHICS
(HIGHER LEVEL)**

**MARKING SCHEME
AND SAMPLE SOLUTIONS**



The solutions presented are examples only.
All other valid solutions are acceptable and are marked accordingly.

QUESTION A-1

MARKS

- (a) **Projections of shortest distance (17)**
- (i) Creating a plane containing AB (or CD) and parallel to CD (or AB)4
 - (ii) Finding edge view of plane... (1, 1, 2)4
 - (iii) X_2Y_2 parallel to skew lines3
 - (iv) Identification of shortest distance in 2nd aux3
 - (v) Draw req. projections (projecting or measuring to plan and elevation)3
- (b) **Length of shortest distance (3)**
- (vi) Correct length of shortest distance indicated3

Total = 20

QUESTION A-2

MARKS

Axonometric Projection (20)

- (i) Projections from plan and elevation2
- (ii) Determining points incl. sphere centre (11 x 1)11
- (iii) Use of correct radius3
- (iv) Completion of axonometric view4

Total = 20

QUESTION A-3

MARKS

| | | |
|------------|--|----|
| (a) | Vertex and Curve (15) | |
| | (i) Locate vertex | 3 |
| | (ii) Locate points outside latus rectum (2, 4) | 6 |
| | (iii) Locate point inside latus rectum | 3 |
| | (iv) Draw curve (Any = 1) | 3 |
| | | |
| (b) | Tangent (5) | |
| | (v) Identify point 45mm from focus | 1 |
| | (vi) Required construction and draw tangent ... (3, 1) | 4 |
| | | 20 |
| | <i>Total =</i> | |

QUESTION A-4

MARKS

| | | |
|------------|--|----|
| (a) | Elevation of cut surface (17) | |
| | (i) X_1Y_1 perp. to H.T. | 3 |
| | (ii) Edge view of the plane | 4 |
| | (iii) Projections from plan of prism | 3 |
| | (iv) Auxiliary view of prism | 2 |
| | (v) Transfer of heights to elevation | 3 |
| | (vi) Completion of elevation | 2 |
| | | |
| (b) | Inclination of the cut surface to H.P. (3) | |
| | (vii) Indication of angle (tolerance = 41° - 47°) | 3 |
| | | 20 |
| | <i>Total =</i> | |

QUESTION B-1

MARKS

(a) Given Plan (8)

(i) Draw the given plan(8 x 1)8

(b) Perspective

Setup (12)

(ii) Position spectator and plan of picture plane (1, 3).....4

(iii) Plan of vanishing points.....2

(iv) Ground line, horizon line, vanishing points in elevation (1, 1, 2)4

(v) Projection lines from plan to spectator and to elevation2

Perspective of steps, walls and underside of stand (20)

(vi) Perspective of base lines of structure(2, 2, 1)5

(vii) Measure and apply height H^1 and complete 1st step (top surface).....3

(viii) Measure and apply height H^2 and complete 2nd step (top surface)3

(ix) Measure and apply height H^3 and complete 3rd step (top surface)3

(x) Measure and apply height H^4 and complete walls3

(xi) Complete perspective including underside of stand (excluding roof)3

Perspective of sloping roof (5)

(xii) Determine auxiliary vanishing point.....2

(xiii) Completion of roof ...(3 surfaces)3

Total = 45

QUESTION B-2

MARKS

| | |
|---|----|
| (a) Plan and elevation of skyscraper (excl. curve in elevation) (19) | |
| (i) Draw the given plan (excl. arc)..... | 6 |
| (ii) Locate centre and draw arc | 3 |
| (iii) Draw elevation (excl. curve)..... | 8 |
| (iv) Hidden detail | 2 |
| (b) Elevation of curved recess (13) | |
| (v) Accurate location of points on curve in elev. (min. 5 incl. turning point)..... | 10 |
| (vi) Draw curve in elevation (Any = 1) | 3 |
| (c) Traces of oblique plane (9) | |
| (vii) Draw horizontal trace of oblique plane | 3 |
| (viii) Construction to determine vertical trace | 4 |
| (ix) Draw vertical trace | 2 |
| (d) Angle between traces (4) | |
| (x) Construction to determine req. angle | 4 |

Total = 45

QUESTION B-3**MARKS**

| | |
|---|----|
| (a) Plan and elevation of planes ABC and ABD (15) | |
| (i) Interpretation of co-ordinates | 10 |
| (ii) Drawing outline of planes | 5 |
| (b) Dihedral angle (17) | |
| (iii) New XY taken parallel to line of intersection..... | 5 |
| (iv) Projection of planes and line of intersection on new XY | 4 |
| (v) Additional XY taken perpendicular to line of intersection | 4 |
| (vi) Projection of ABC and ABD as lines and indicating dihedral angle | 4 |
| (c) True shape of triangle ABC (9) | |
| (vii) Identification of one edge on true shape | 4 |
| (viii) Determination of 3 rd vertex on true shape | 3 |
| (ix) Identification of true shape.....(Any = 1)..... | 2 |
| (d) Traces of plane containing ABC (4) | |
| (x) Construction to determine H.T. | 1 |
| (xi) Drawing of H.T. | 1 |
| (xii) Construction to determine V.T. | 1 |
| (xiii) Drawing of V.T. | 1 |

Total = 45

QUESTION C-1**MARKS****(a) Earthworks for roadway (37)*****Earthworks between A and B (Level) - Cutting***

- (i) Draw parallel lines at 7.5m intervals5
 (ii) Identify intersections with contours and draw curve6

Earthworks between A and B (Level) - Embankment

- (iii) Draw parallel lines at 10m intervals4
 (iv) Identify intersections with contours and draw curve4

Earthworks between B and C (Rising) - Embankment

- (v) Draw required arc4
 (vi) Draw parallel lines at 10m intervals3
 (vii) Identify intersections with contours and draw curve6

Intersection between level and rising earthworks

- (viii) Establishment of additional points (P & Q)(2, 1)3
 (ix) Completion of intersection2

(b) (i) Dip of stratum (3)

- (x) Draw X_1Y_1 perp. to strike line1
 (xi) Determine dip2

(ii) Thickness of stratum (5)

- (xii) 25mm arc vertically from F3
 (xiii) Determine required thickness2

Total = 45

QUESTION C-2

MARKS

- (a) Outline plan and elevation of hat (24)**
- (i) Draw ABCD in plan and elevation ... (4, 2)6
 - (ii) Draw ellipse ... (Any ellipse = 2)4
 - (iii) Elements in plan and elevation (min. 3 internal)4
 - (iv) Draw tangential (parabolic) curve in elevation... (Any = 1)3
 - (v) Extend elements to ellipse in plan2
 - (vi) Extend elements in elevation to locate points on curve2
 - (vii) Draw lower curve in elevation ... (Any = 1)3
- (b) Plan and elevation of hole (13)**
- (viii) Draw circular hole in plan1
 - (ix) Establish end points on curve in elevation (2, 1)3
 - (x) Establish intermediate points on curve in elevation ... (min. 4) ... (2, 1)3
 - (xi) Additional element to locate turning point... (1, 1, 1)3
 - (xii) Draw correct curve in elevation3
- (c) Plane director (8)**
- (xiii) Draw HT passing through BC in plan5
 - (xiv) Draw VT perp. to XY in elevation3

Total = 45

QUESTION C-3

MARKS

| | | |
|------------|--|---|
| (a) | Plan and elevation (18) | |
| | (i) Draw given elevation(2, 2, 3) | 7 |
| | (ii) Draw rectangular outline of plan | 4 |
| | (iii) Construction to determine point on line of intersection in plan | 4 |
| | (iv) Completion of plan | 3 |
| (b) | Dihedral angle (9) | |
| | (v) View showing true length of line of intersection between A and B | 4 |
| | (vi) Construction to determine dihedral angle | 3 |
| | (vii) Indicating dihedral angle..... | 2 |
| (c) | Surface developments (18) | |
| | (i) Surfaces B and C | |
| | (viii) Use of correct widths on surface B (or surface C) | 1 |
| | (ix) Use slope length to draw development of this surface | 2 |
| | (x) Determine true length of a diagonal on surface C (or surface B) | 3 |
| | (xi) Determine 2 other points on development of surface C (or surface B) | 4 |
| | (xii) Completion of development | 2 |
| | (ii) Cylindrical surface D | |
| | (xiii) Establish lengths and widths for development(2, 2)..... | 4 |
| | (xiv) Completion of development (to include underside)(1, 1)..... | 2 |

Total = 45

QUESTION C-4

MARKS

(a) Link Mechanism (21)

- (i) Setup line diagram as given ... (2, 2, 2)6
- (ii) Divide circle into 12 parts ... (<12 = 2).....4
- (iii) Drawing of tangents at correct lengths ... (3, 3)6
- (iv) Draw required locus (to incl. correct sequencing of points)... (Any = 1)5

(b) Cam and Displacement Diagram (24)

- (v) Correct use of nearest approach1
- (vi) Horizontal divisions on displacement diagram (<12 = 1).....2
- (vii) Use of 40mm rise on displacement diagram1
- (viii) S.H.M. construction and curve on displacement diagram ... (2, 2)4
- (ix) Dwell on displacement diagram1
- (x) Angular divisions for cam profile (corresponding with (vi) above)2
- (xi) Identification of points on profile between 0° and 270°3
- (xii) Complete cam profile (draw arc and tangent) ... (1, 1).....2
- (xiii) Identification of 3 points on disp. diag. between 271° and 360° (a, b & c).....3
- (xiv) Identification of intermediate point, p1
- (xv) Draw correct curve on displacement diagram1
- (xvi) Draw curve on cam profile, incl. arc to identify dwell ... (Any = 1)3

Total = 45

QUESTION C-5**MARKS****(a) Sectional elevation (42)*****Assembly (6)***

(i) Relative positioning of components (incl. 24mm bar).....6

Frame (8)

(ii) Outline.....5

(iii) Inner detail2

(iv) Thread1

24mm Bar (3)

(v) Location of centre2

(vi) Outline of bar1

Moving Jaw & Clamp Screw (7)

(vii) Tangential positioning2

(viii) Moving Jaw.....2

(ix) Clamp Screw (ignore inner detail).....2

(x) Thread1

Swivel Mount & Locknut (5)

(xi) Swivel Mount3

(xii) Locknut1

(xiii) Thread1

Swivel Clamp (4)

(xiv) Outline.....2

(xv) Inner detail1

(xvi) Thread1

Drawing Completion (9)

(xvii) Fillets and Chamfers2

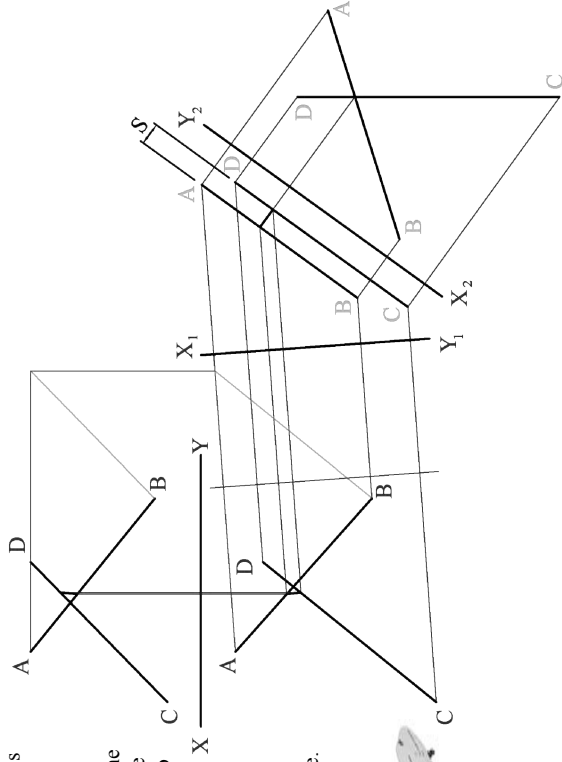
(xviii) Presentation, Hatching and Centrelines ... (2, 4, 1)7

(b) Maximum rotation of swivel mount (3)

(xix) Radiating lines and indication of angle.....3

Total = 45

A-1. The flight paths of two aircraft are represented by the two skew lines AB and CD.



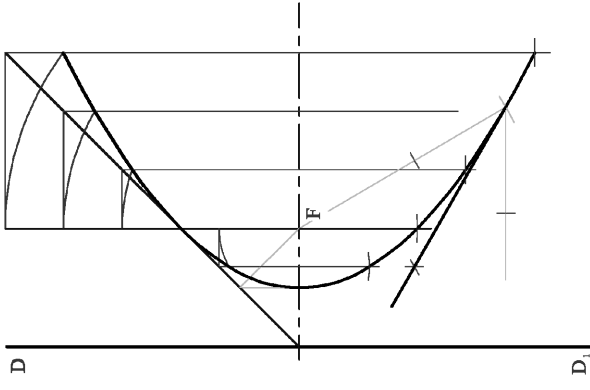
- (a) Determine the projections of the shortest distance between the two lines.
- (b) Determine and indicate the length of this shortest distance.



A-3. A parabolic curve is often used in the design of racing tracks.

The drawing on the right shows the axis, directrix and focus of a parabola.

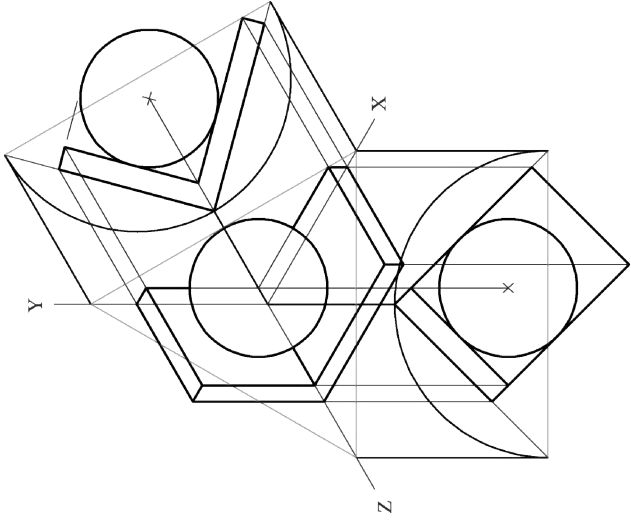
- (a) Locate the vertex and draw a portion of the curve.
- (b) Draw a tangent to the curve at a point 45mm from the focus.



A-2. A pair of bookends, each of which incorporates a globe, and some books are shown in the 3D graphic below.

A set of isometric axes is shown on the right and the elevation and plan of a bookend, which incorporates a globe, have been positioned as shown.

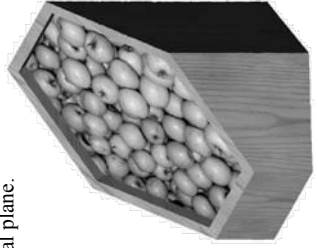
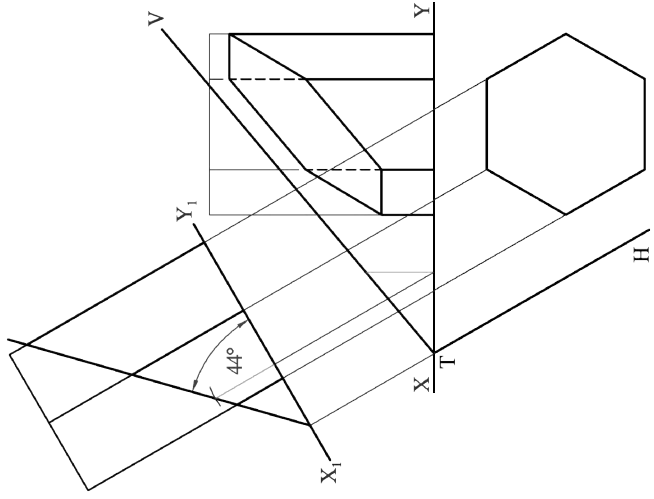
Draw the axonometric projection of the bookend.

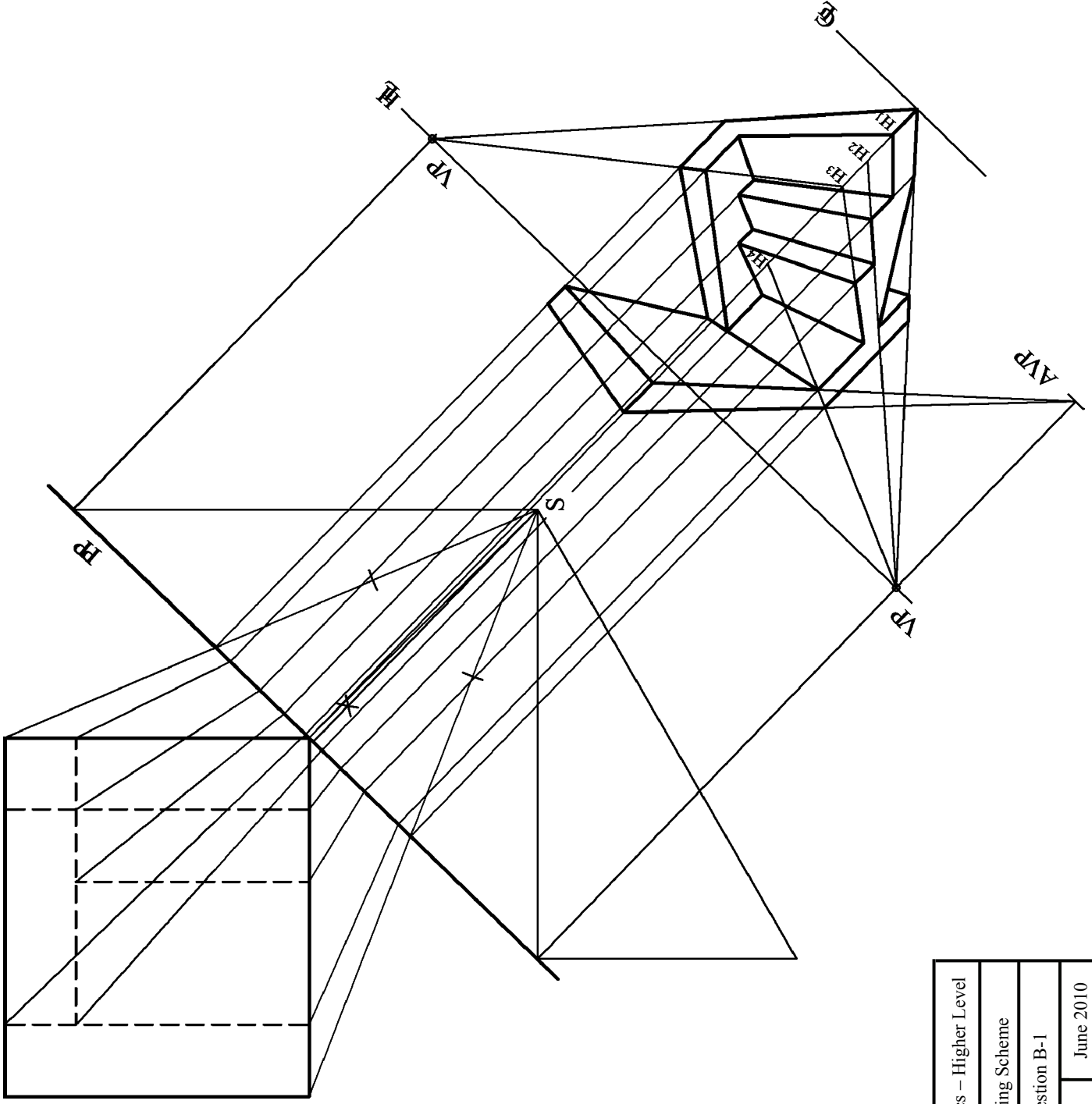


A-4. The 3D graphic below shows a design of a display box for fruit. The box consists of a regular hexagonal prism which has been cut as shown.

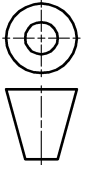
The drawing on the right shows how the prism is cut to form the sloping surface.

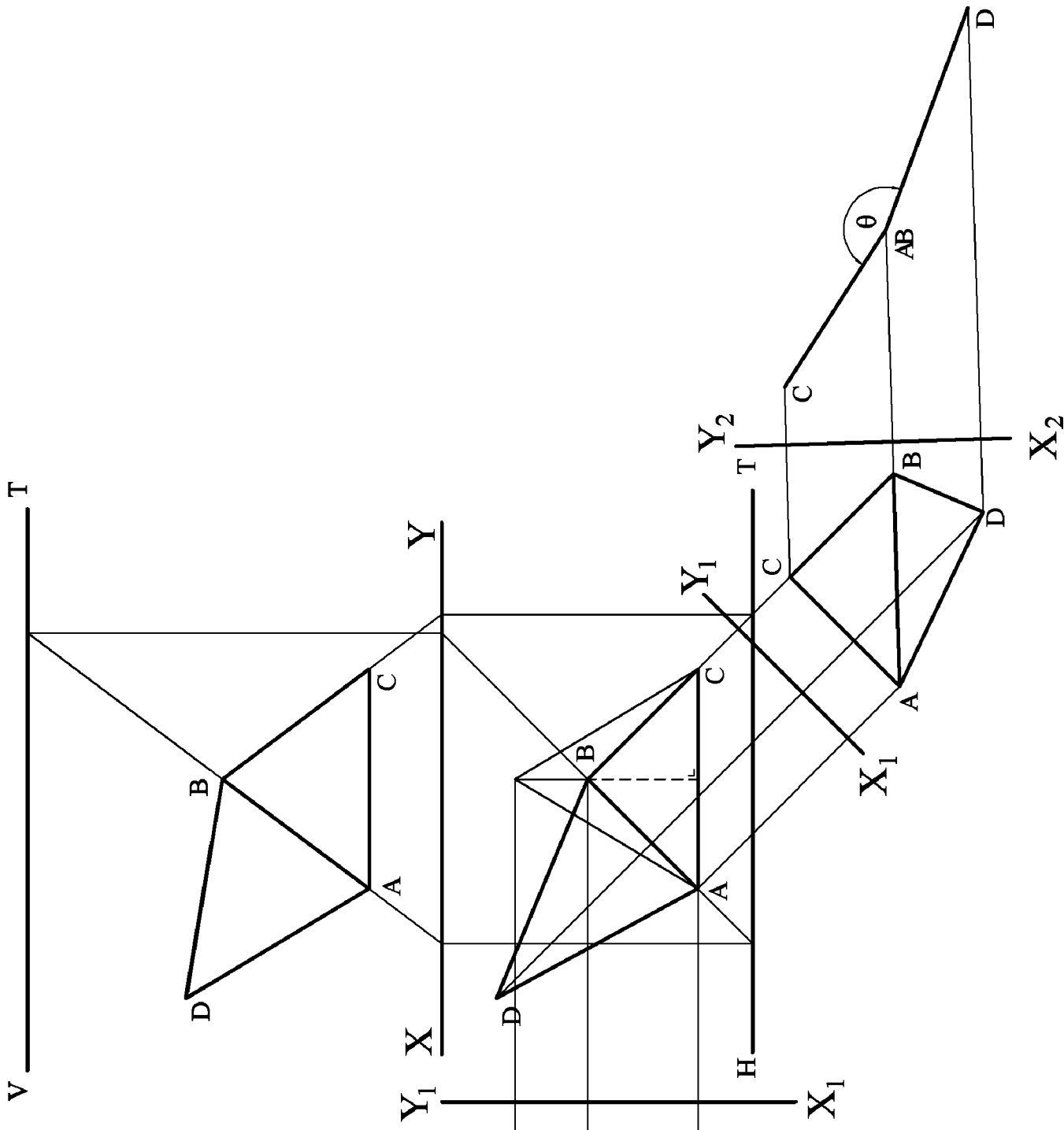
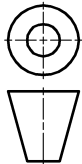
- (a) Draw the elevation of the prism when cut by the oblique plane VTH.
- (b) Determine, and indicate in degrees, the inclination of the cut surface to the horizontal plane.

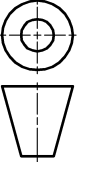
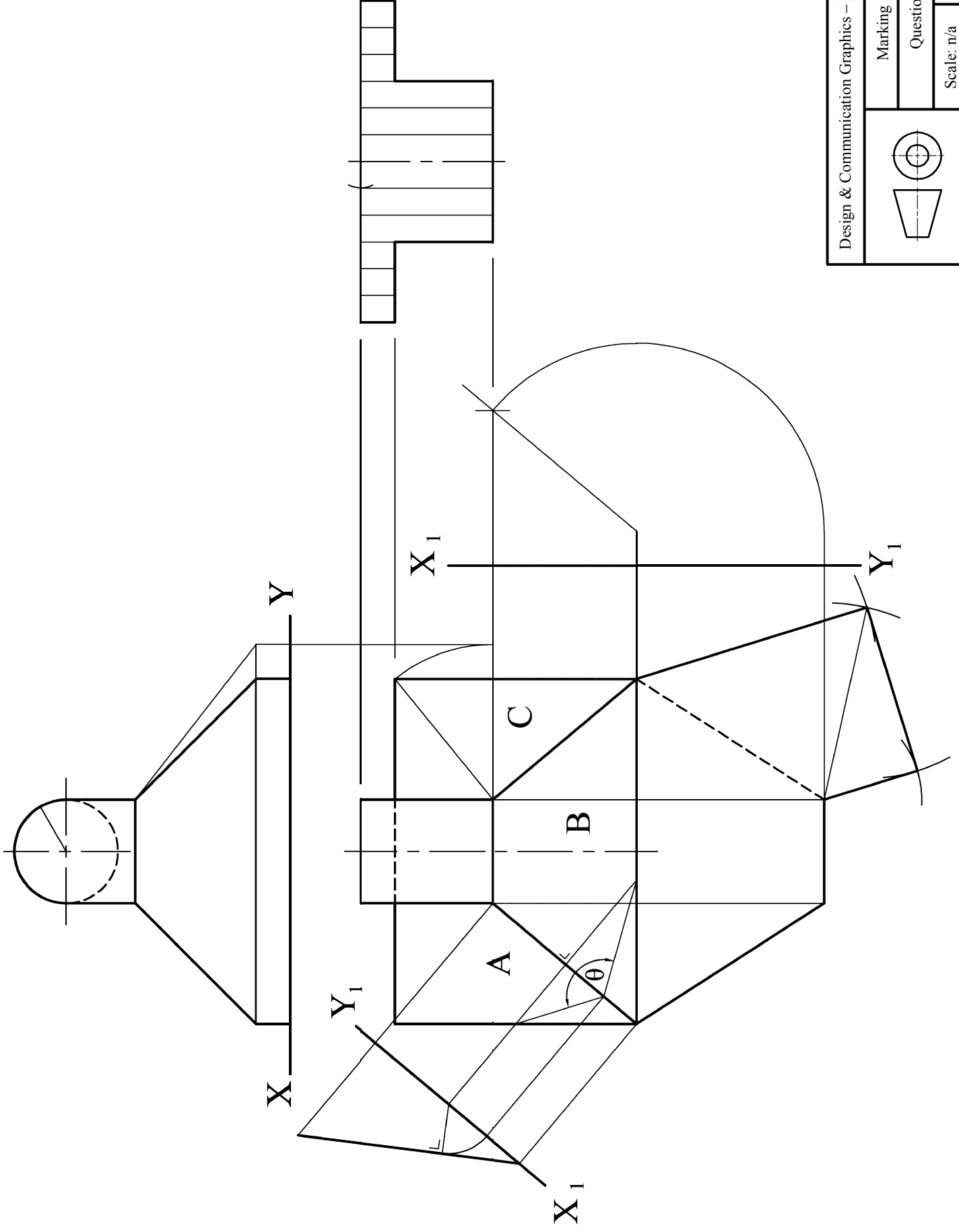


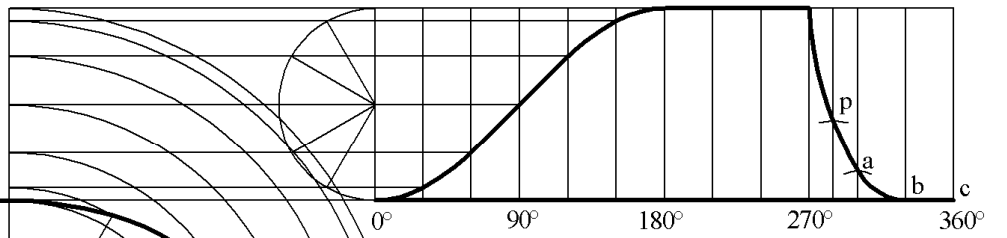
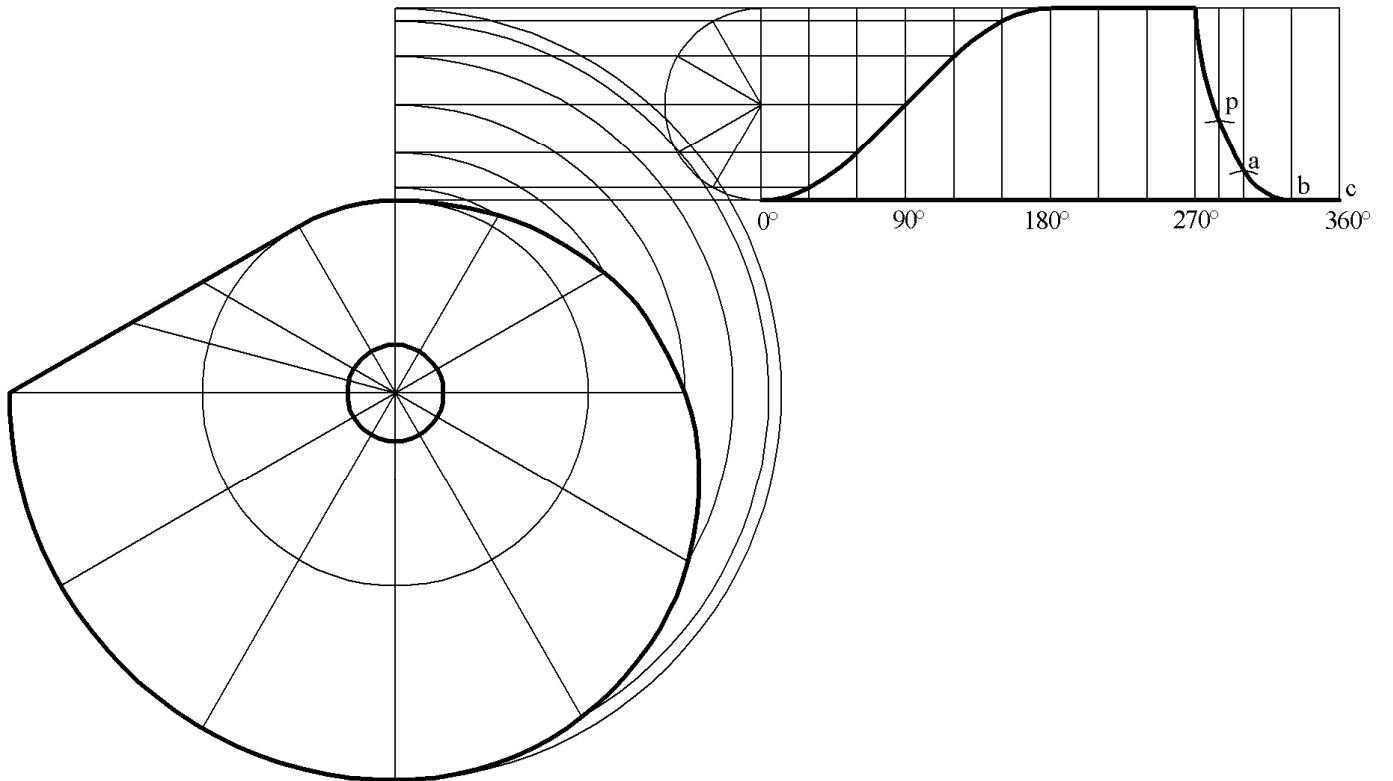
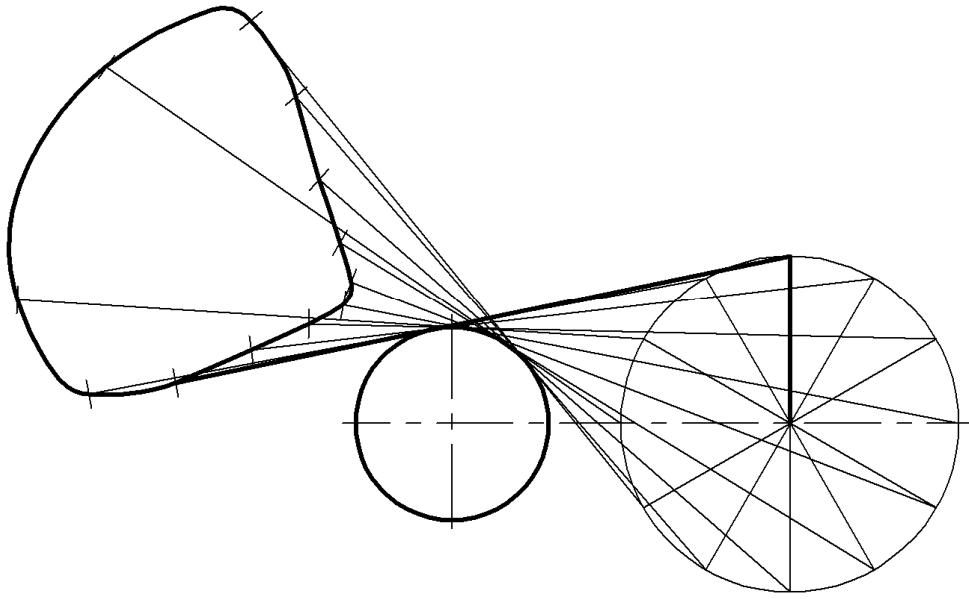


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| Design & Communication Graphics – Higher Level | |
| Marking Scheme | |
| Question B-I | |
| Scale: n/a | June 2010 |



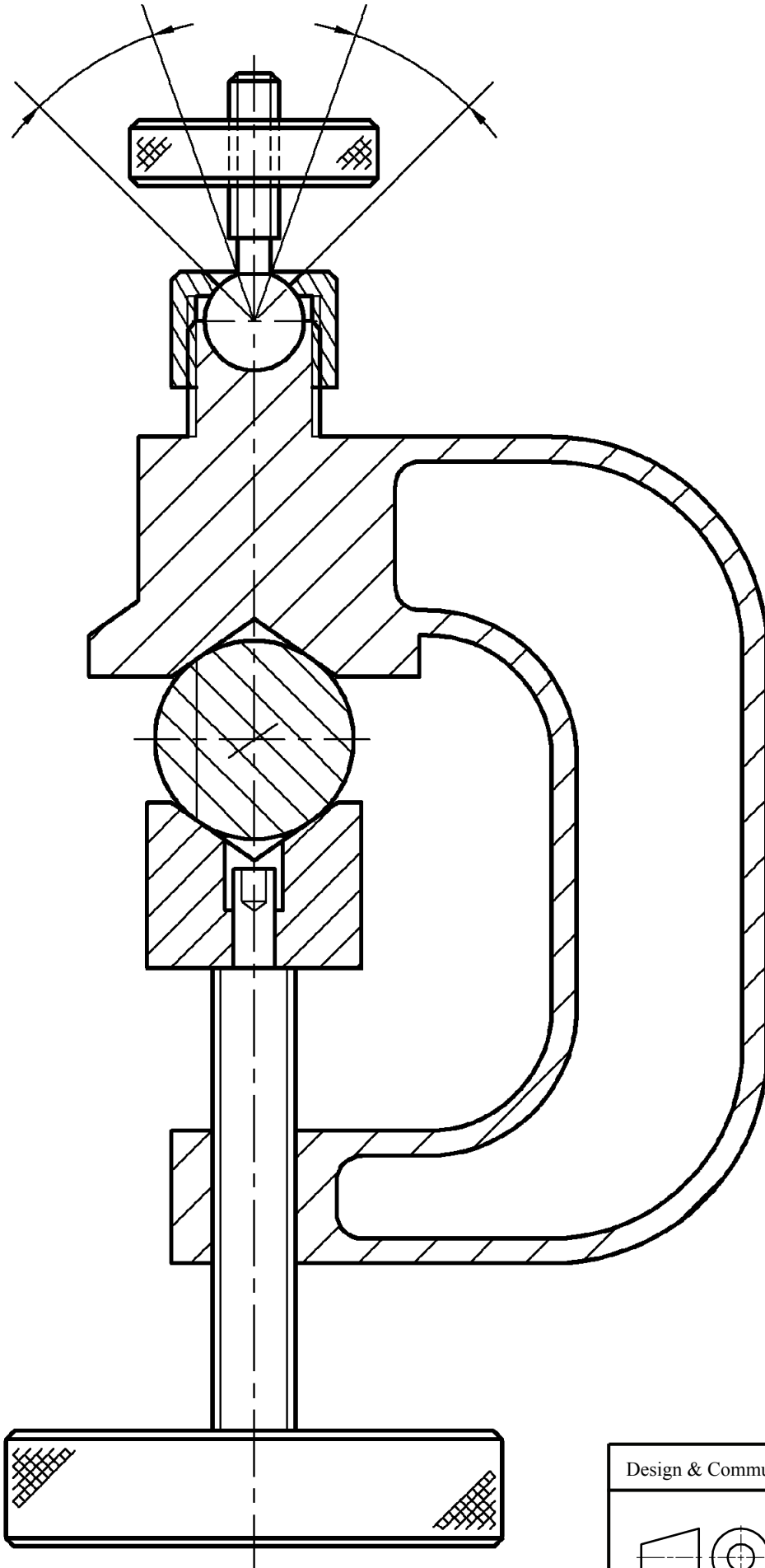




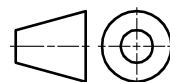


| | |
|--|------------------------|
| Design & Communication Graphics – Higher Level | |
| | Marking Scheme |
| | Question C-4 |
| | Scale: n/a June 2010 |

$$26^\circ \times 2 = 52^\circ$$



Design & Communication Graphics – Higher Level



Marking Scheme

Question C-5

Scale: n/a

June 2010



Design and Communication Graphics

Student Assignment—Higher Level

Assessment Sheet

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) All 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) All 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) All 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 and eDrawing | |
| | • Adherence to required filing structure | 3 |
| | • Creation of a minimum of 5 Part files | 3 |
| | • 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) All 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 Image | |
| | Produce a photorealistic computer generated image 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) All 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) All 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) All 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 |

