



# Coimisiún na Scrúduithe Stáit State Examinations Commission

*Scéimeanna Marcála*

*Scrúduithe Ardteistiméireachta, 2005*

*Líníocht Theicniúil*

*Ardleibhéal*

*Marking Scheme*

*Leaving Certificate Examination, 2005*

*Technical Drawing*

*Higher Level*

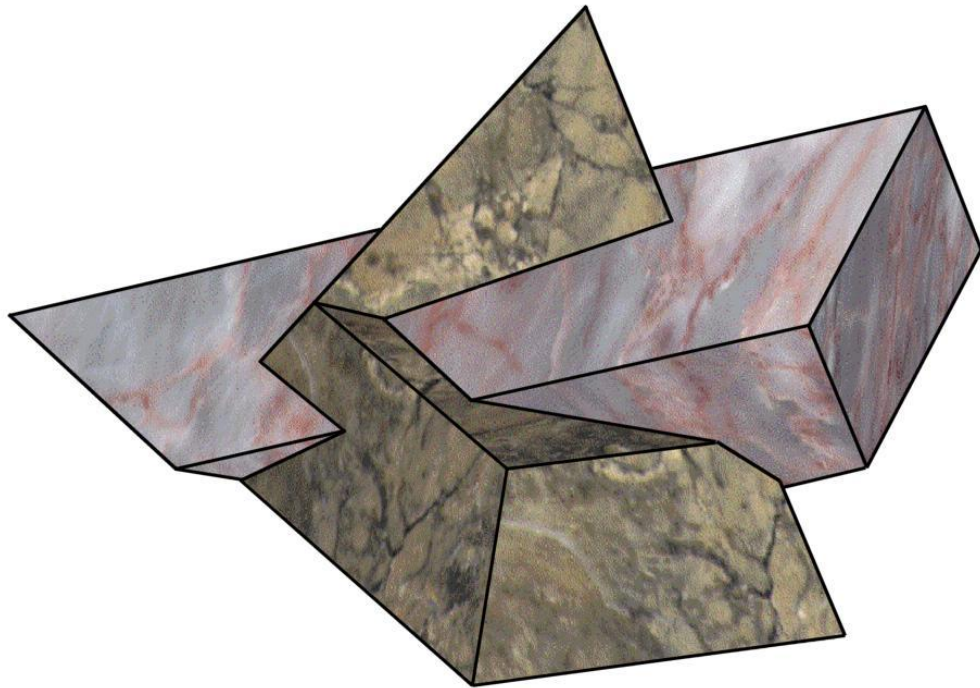


**Coimisiún na Scrúduithe Stáit**  
*State Examinations Commission*

---

*Leaving Certificate Examination 2005*

***Technical Drawing***  
***Paper 1 - Higher Level***  
***(Plane & Solid Geometry)***



***Marking Scheme***  
***and Sample Solutions***

*(Other valid solutions are acceptable and marked accordingly)*

**QUESTION 1****MARKS****Plan and Elevation of planes ABC and ADE**

- (i) Interpretation of co-ordinates..... 2
- (ii) Drawing outline of planes..... 2

**(a) Line of Intersection**

- (iii) Horizontal line in elevation (or line parallel to V.P.) ..... 2
- (iv) Projections in plan (or elevation) ..... 2
- (v) Drawing line of intersection in plan and elevation ..... 2

***or***

- (iii) Edge view of one plane in auxiliary view...(1,1)..... 2
- (iv) Projection of other plane..... 2
- (v) Determining projections of line of intersection..... 2

**(b) Dihedral angle**

- (i) New  $X_1Y_1$  taken parallel to line of intersection..... 2
- (ii) Projection of ABC and ADE on new  $X_1Y_1$  ..... 3
- (iii) New  $X_2Y_2$  taken perpendicular to line of intersection ..... 3
- (iv) Projection of ABC and ADE on  $X_2Y_2$  and indicating dihedral angle .. 5

**(c) Determining line from D**

- (i) Locating horizontal line on plane ABC 50mm  
above H.P. in **an** elevation and in plan...(1,3).. ..... 4
- (ii) Drawing line from D at  $40^\circ$  to ABC in a view  
showing plane ABC as an edge..... 2
- (iii) Drawing correct arc about D in plan ..... 2
- (iv) Drawing correct required line in plan and elevation..... 2

**(d) Skew lines**

- (i) Creating a plane containing AE (or BC)  
and parallel to BC (or AE)..... 2
- (ii) Finding edge view of plane..... 2
- (iii)  $X_2Y_2$  perpendicular to  $X_1Y_1$  line ..... 2
- (iv) Location of shortest horizontal line and projection to 1<sup>st</sup> aux. .... 2
- (v) Projecting or measuring to plan and elevation ..... 4
- (vi) Indicating inclination of shortest horizontal line to V.P. .... 5

or

- (i) Creating a plane containing AE (or BC)  
and parallel to BC (or AE)..... 2
- (ii) New  $X_1Y_1$  taken parallel to plan of level line..... 2
- (iii) Projection of AE and BC on new  $X_1Y_1$ ..... 4
- (iv) Projecting to plan and elevation..... 4
- (v) Indicating inclination of shortest horizontal line to V.P. .... 5

**Total** **50**

**QUESTION 2**

**MARKS**

**(a) Drawing given figure**

- (i) Drawing line AB ..... 2
- (ii) Finding mean proportional CF between AF and FB..... 7
- (iii) Location of point C..... 2
- (iv) Location of point O and drawing of circle ..... 3
- (v) Location of point D ..... 1
- (vi) Plotting of locus between A and D ... (2,1,1) ..... 4
- (vii) Completion of pentagon ABCDE ..... 4

**(b) Division of Area**

- (i) Joining DO ..... 1
- (ii) Conversion of ABCDE into quadrilateral leaving point D and line AB intact... (Any = 1) ..... 3
- (iii) Conversion of quadrilateral into triangle leaving point D and line AB intact... (Any = 1) ..... 3
- (iv) Division of base in the ratio 4:5 ..... 3
- (v) Joining O to division point and drawing parallel from D... (1,2) ..... 3
- (vi) Completion of division ..... 2

**(c) Equilateral Triangle**

- (i) Redrawing of circle and chord CD..... 2
- (ii) Locating 1<sup>st</sup> vertex on circle/line..... 1
- (iii) Locating 2<sup>nd</sup> vertex on circle/line 125mm from 1<sup>st</sup> vertex ..... 2
- (iv) Locating 3<sup>rd</sup> vertex and drawing circle/locus... (1,3) ..... 4
- (v) Locating other two vertices of required triangle and drawing same .... 3

**Total**

**50**

**QUESTION 3**

**MARKS**

**(a) Cone A and Sphere B**

- (i) Elevation and plan of cone A..... 3
- (ii) Locate centre of sphere B in elevation and draw elevation of B..... 2
- (iii) Bisection of angle between cone edge and 15mm line extended  
or draw line Rmm from edge of cone ..... 2
- (iv) Locate centre ..... 2
- (v) Project centre point to plan and rotate about cone A..... 4
- (vi) Locate centre in plan and draw plan of sphere (incl. hidden detail).... 4

**(b) Projections of Cone C**

- (i) Location of point 33mm above H.P. at edge of sphere in elevation..... 1
- (ii) Drawing of normal and tangent at this point.....(2,2)..... 4
- (iii) Elevation of point P ..... 1
- (iv) Locate plan of point P and draw line OP extended...(1,1)..... 2
- (v) Drawing one set of relevant arcs/lines ..... 3
- (vi) Drawing second set of arcs/lines corresponding with (v) ..... 4
- (vii) Drawing of correct locus ..... 1
- (viii) Draw plan of correct cone (incl. hidden detail) ..... 2
- (ix) Draw elevation of correct cone (incl. hidden detail) ..... 2

**(c) Tangent Plane**

- (i) Elevation and plan of correct cone at apex of cone C..... 5
- (ii) Horizontal trace tangential to both circles..... 2
- (iii) Construct and draw vertical trace..... 3
- (iv) Rabatment of V.T. onto H.P. and indicating angle...(2,1) ..... 3

**Total** **50**

**QUESTION 4**

**MARKS**

**Outline Plan and Elevation**

- (i) Drawing outline plan of rectangular based pyramid..... 3
- (ii) Drawing outline elevation of shaped solid ..... 4
- (iii) Drawing of cut surface in plan..... 3
- (iv) Drawing outline elevation of inclined prism...(3,1)..... 4
- (v) Transfer of widths to plan..... 3

**Interpenetration**

- (vi) Determining points **A, B & C** in elevation and plan ..... 3
- (vii) Determining points **D & E** in elevation and plan...(2,3)..... 5
- (viii) Determining points **F, G, H, & I** in elevation and plan...(4x2) ..... 8
- (ix) Determining points **J, K & L** in elevation and plan..... 3
- (x) Determining points **M, N, & O** in elevation and plan ..... 3
- (xi) Determining points **P & Q** in elevation and plan ..... 2
- (xii) Joining intersection points in correct order ..... 3
- (xiii) Completion of drawing (incl. hidden detail) ..... 6

**Total** **50**

**QUESTION 5****MARKS****Line AB**

- |        |   |   |
|--------|---|---|
| (i)    | Drawing figure as given.....  | 4 |
| (ii)   | Dividing quadrant into a number of equal parts .....  | 2 |
| (iii)  | Stepping distances to locate B <sub>1</sub> , B <sub>2</sub> , and B <sub>3</sub> .....   | 2 |
| (iv)   | Erection of perpendiculars to locate O <sub>1</sub> , O <sub>2</sub> , and O <sub>3</sub> .....   | 3 |
| (v)    | Drawing arcs radius OP from O <sub>1</sub> , O <sub>2</sub> and O <sub>3</sub> , respectively .....   | 3 |
| (vi)   | Drawing arcs C <sub>1</sub> -P, C <sub>2</sub> -P, C <sub>3</sub> -P from B <sub>1</sub> , B <sub>2</sub> , B <sub>3</sub> , respectively ..... | 3 |
| (vii)  | Location of centre of circle at intersection of line and curve.....   | 2 |
| (viii) | Location of P on circle.....  | 2 |

**Curve BC**

- |       |  |   |
|-------|--|---|
| (i)   | Stepping distances along arc to locate B <sub>4</sub> , B <sub>5</sub> , B <sub>6</sub> and B <sub>7</sub> .....     | 2 |
| (ii)  | Drawing path of centre and locating centres corresponding with (i) ...   | 2 |
| (iii) | Drawing arcs radius OP from O <sub>4</sub> , O <sub>5</sub> , etc .....  | 2 |
| (iv)  | Drawing arcs C <sub>4</sub> -P, C <sub>5</sub> -P, etc from B <sub>4</sub> , B <sub>5</sub> , etc respectively ..... | 4 |
| (v)   | Location of points O <sub>C</sub> and P <sub>C</sub> .....   | 2 |

**Line CD and notch**

- |       |   |   |
|-------|---|---|
| (i)   | Location of points O <sub>8</sub> and P <sub>8</sub> .....                      | 2 |
| (ii)  | Location of points O <sub>D</sub> and P <sub>D</sub> before rotation .....      | 2 |
| (iii) | Location of points O <sub>D</sub> and P <sub>D</sub> in rotated positions ..... | 4 |

**Completion of curve**

- |     |  |   |
|-----|--|---|
| (i) | Plotting of correct complete curve ..... | 9 |
|-----|--|---|

**Total****50**



**QUESTION 6****MARKS**

- (a) (i) Drawing straight line DPF ..... 3  
(ii) Drawing arc from P equal to PF..... 3  
(iii) Drawing directrix passing through D and tangential to arc...(1,2)..... 3  
(iv) Drawing axis and locating points on the curve (min 4 + vertex) ..... 6  
(v) Drawing curve...(Any = 2)..... 4

**Tangent**

- (vi) Drawing line from focus at  $90^\circ$  to DF to meet tangent at vertex ..... 1  
(vii) Determining point of contact ..... 3  
(viii) Drawing of required tangent...(Any = 1)..... 2

**or**

- (vi) Drawing chords parallel to DF, bisecting them, joining midpoints  
& extending line to establish point of contact ..... 4  
(vii) Drawing of required tangent...(Any = 1)..... 2

- (b) (i) Drawing lines FP and PT ..... 3  
(ii) Doubling of  $\angle FPT$  to locate line through second focus ..... 2  
(iii) Location of second focal point..... 4  
(iv) Drawing of axis and location of vertices...(1,1,1)..... 3  
(v) Determination of points on both branches of curve  
(minimum 2 more on each branch) ..... 4  
(vi) Drawing curves...(Any = 1)..... 2

**Centre of curvature**

- (i) Location of point on curve 20mm from F ..... 1  
(ii) Drawing of normal at the point ..... 2  
(iii) Determining centre of curvature...(2,2)..... 4

**Total****50**

**QUESTION 7****MARKS****(a) Outline Plan and Elevation**

- (i) Setting up of VTH and  $V_1T_1H_1$  ..... 6
- (ii) Auxiliary direction and  $X_1Y_1$ .....(3,2)..... 5
- (iii) Edge view of plane ..... 3
- (iv) Drawing elevation of pyramid resting on H.P..... 2
- (v) Pyramid in auxiliary view ..... 3
- (vi) Locating apex in V.P in plan..... 2
- (vii) Required plan of pyramid ..... 5
- (viii) Drawing elevation of pyramid ..... 6

**Alternative Solution** – to replace (ii) – (viii) above

- (ii) Rabatment direction..... 4
- (iii) Rabatted V.T. .... 4
- (iv) Drawing elevation of pyramid resting on H.P..... 2
- (v) Pyramid face in rabatted position..... 4
- (vi) Pyramid face in plan. .... 2
- (vii) Required plan of pyramid (2 further points)..... 4
- (viii) Drawing elevation of pyramid ..... 6

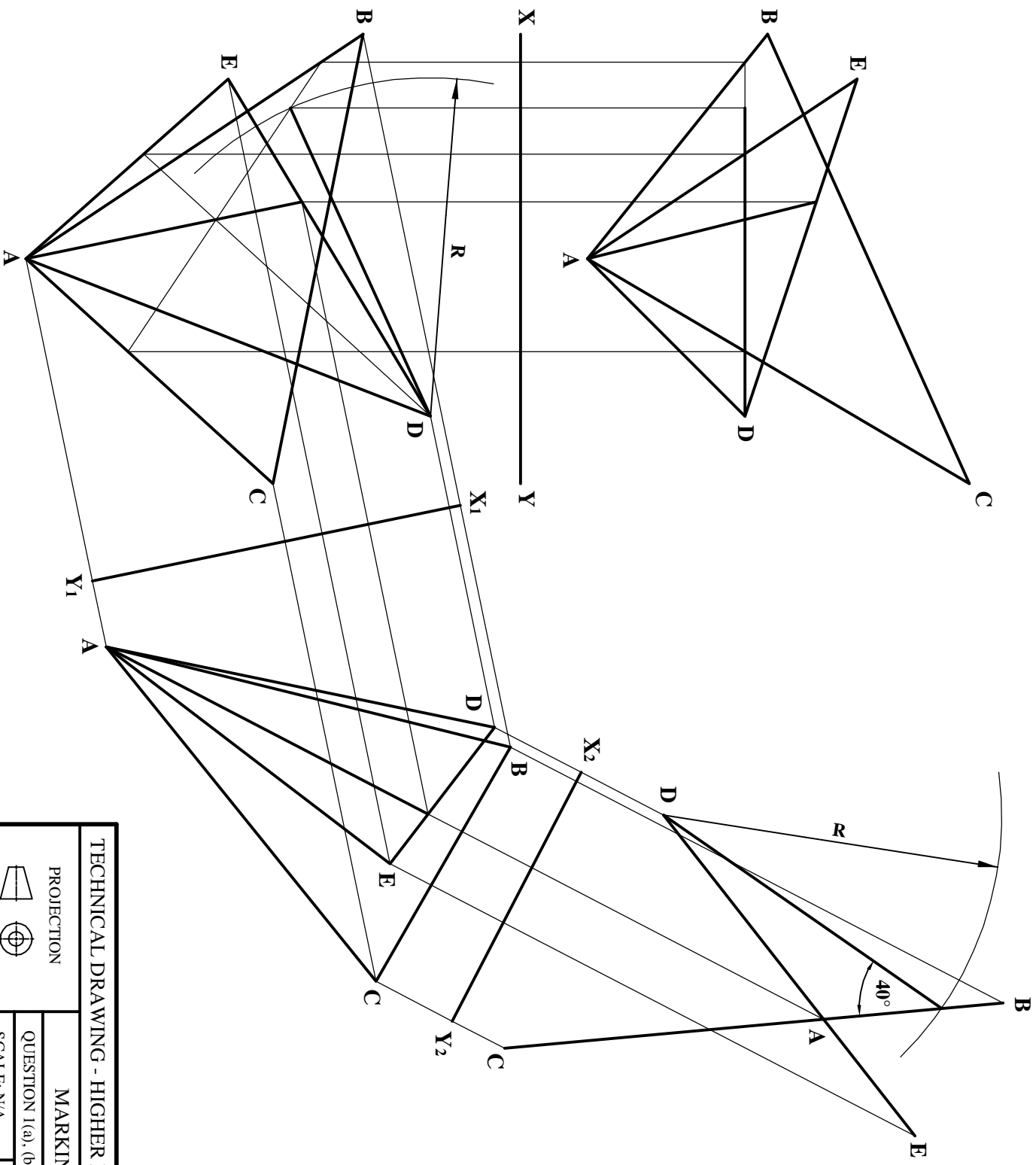
**(b) Cut surface**

- (i) Cut surface in plan..... 4
- (ii) Completion of plan and elevation ..... 6

**(c) Pyramid**

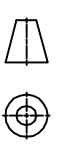
- (i) Projections of edge AB..... 3
- (ii) Drawing plan of pyramid resting on H.P. .... 2
- (iii) Drawing prism base in elevation..... 1
- (iv) Drawing elevation of pyramid ..... 1
- (v) Drawing plan of pyramid..... 1

**Total****50**



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

PROJECTION

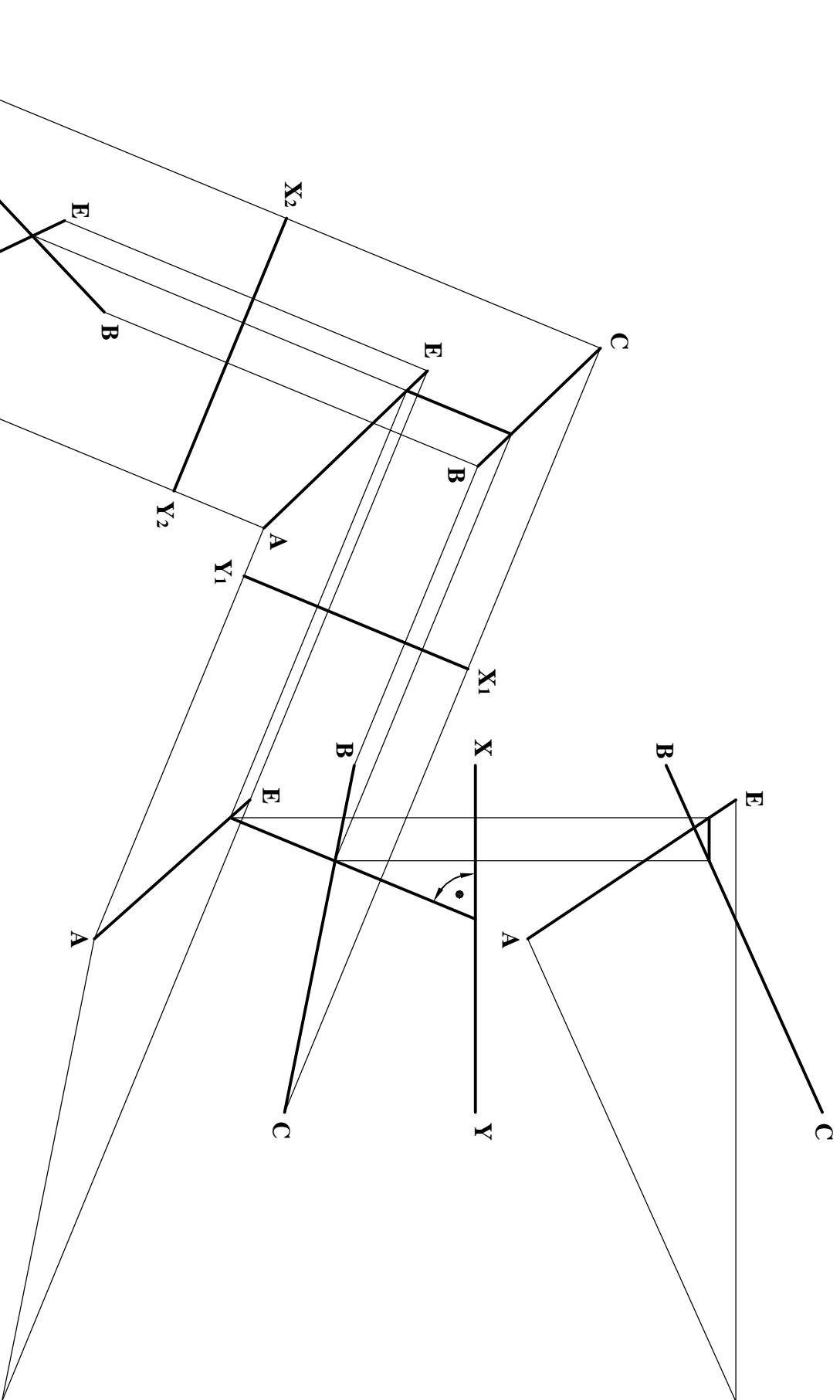


MARKING SCHEME.

QUESTION 1(a), (b) & (c).

SCALE: N/A.

DATE: JUNE 2005.



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

PROJECTION

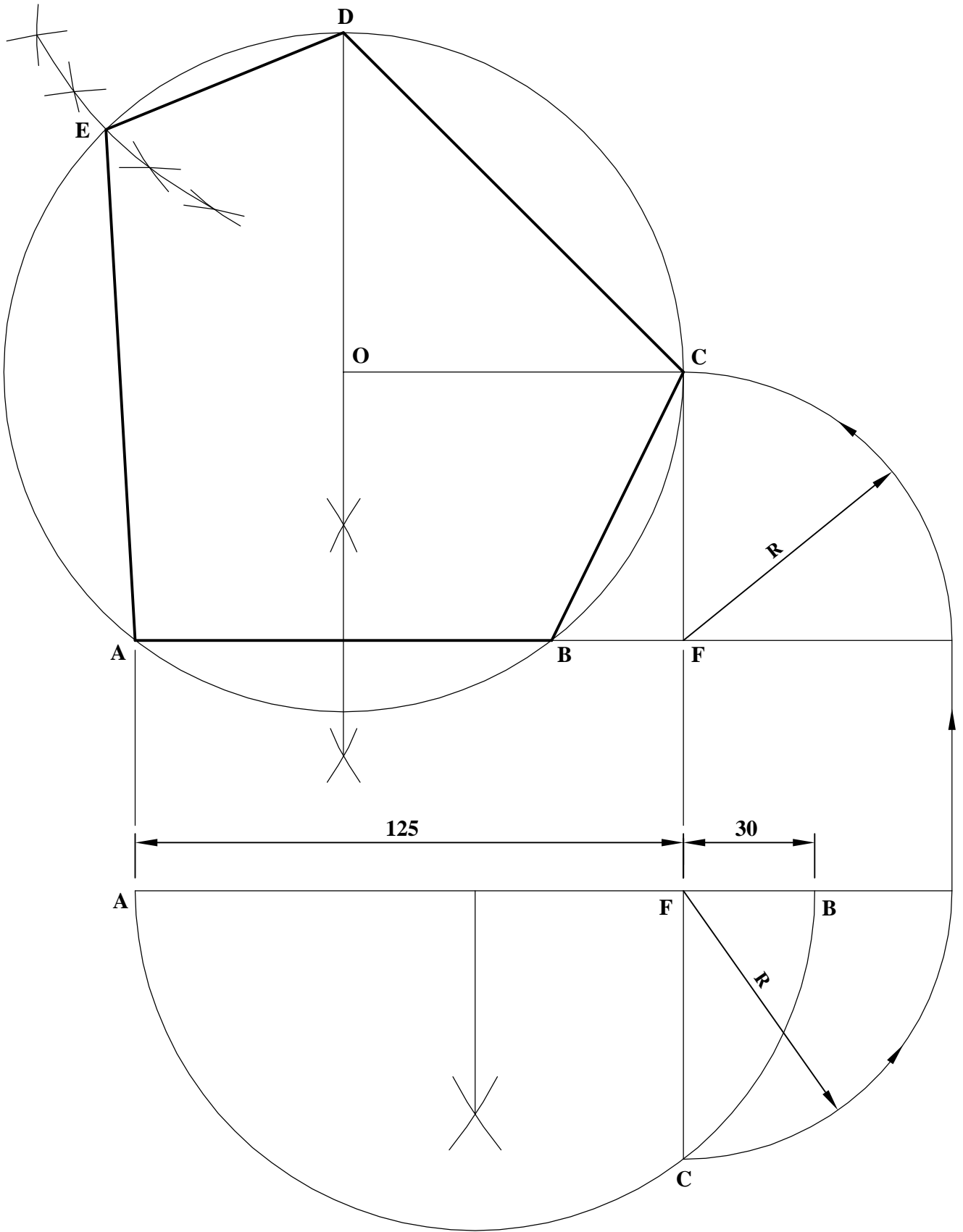


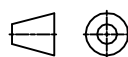
MARKING SCHEME.

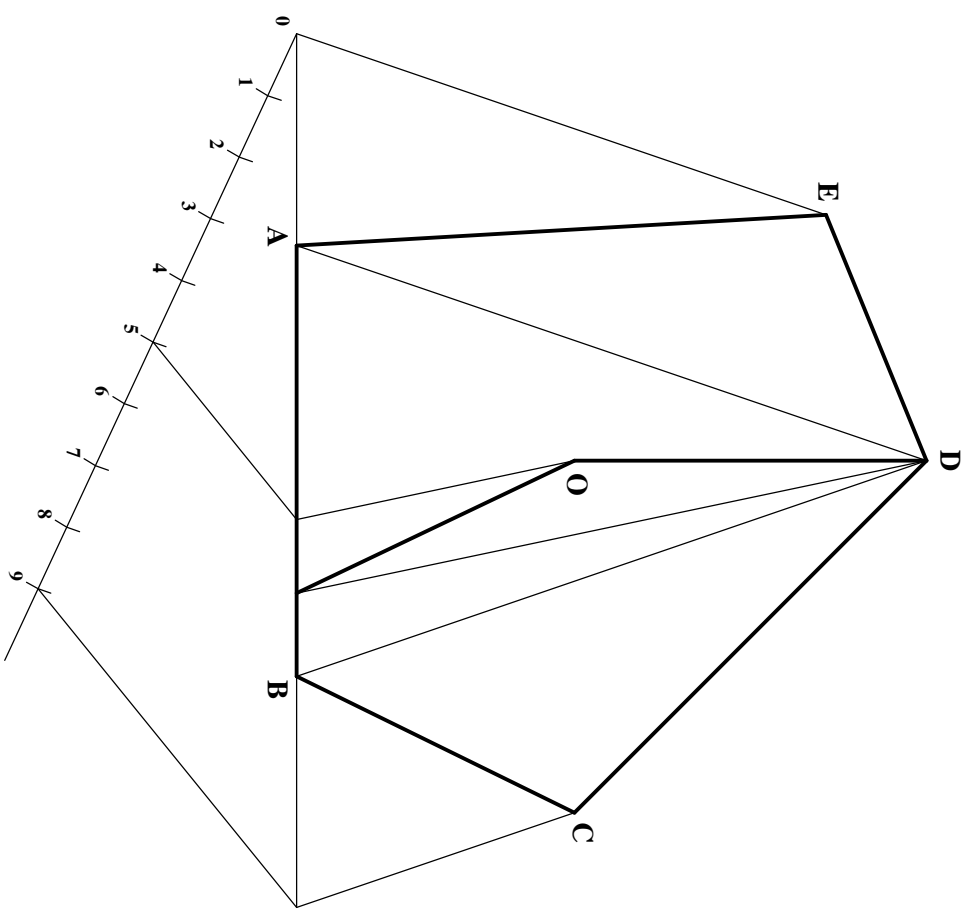
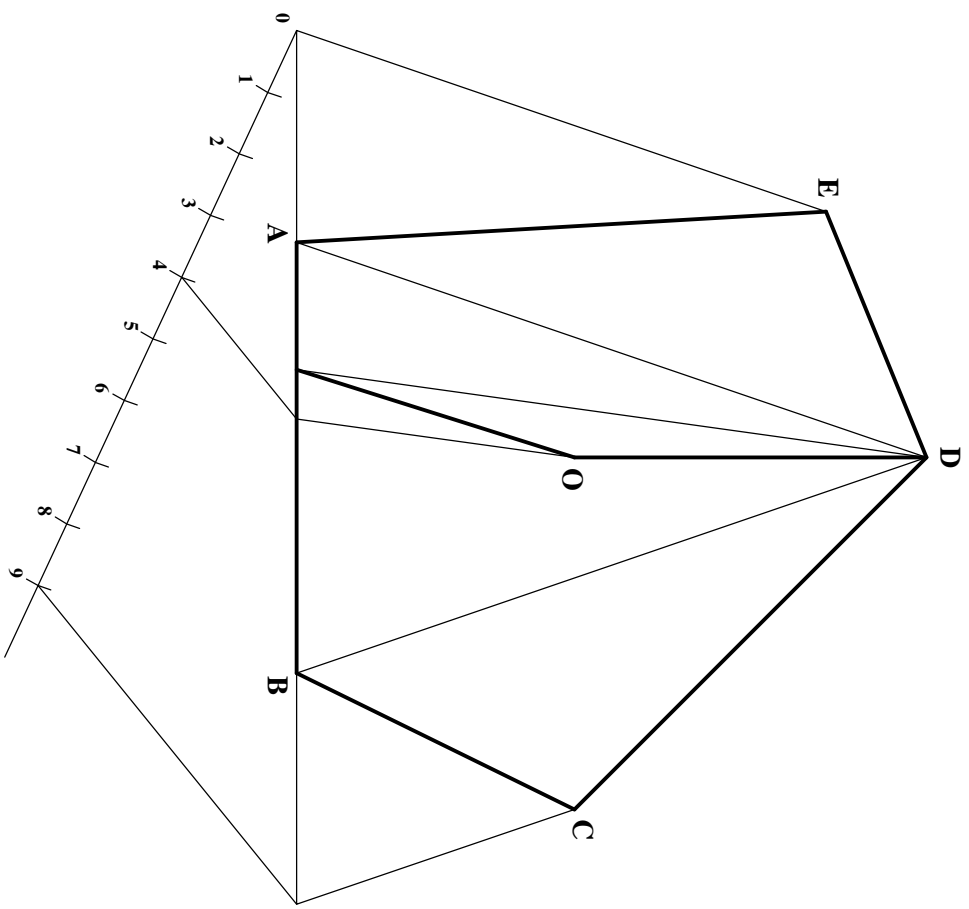
QUESTION 1(d)

SCALE: N/A.

DATE: JUNE 2005.



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.	
PROJECTION	MARKING SCHEME.
	QUESTION 2(a).
	SCALE: N/A.      DATE: JUNE 2005.



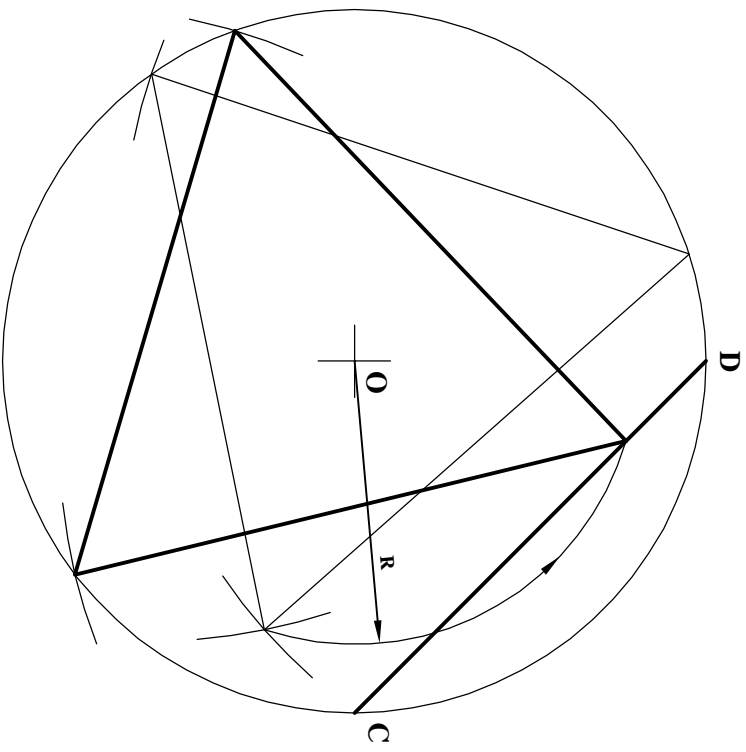
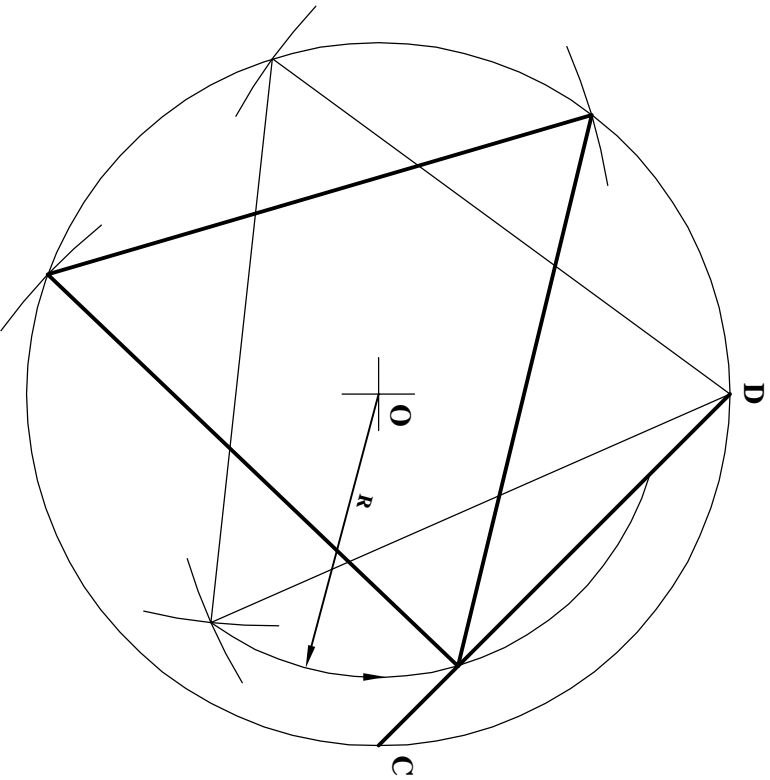
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

MARKING SCHEME.

QUESTION 2(b).

SCALE: N/A.

DATE: JUNE 2005.



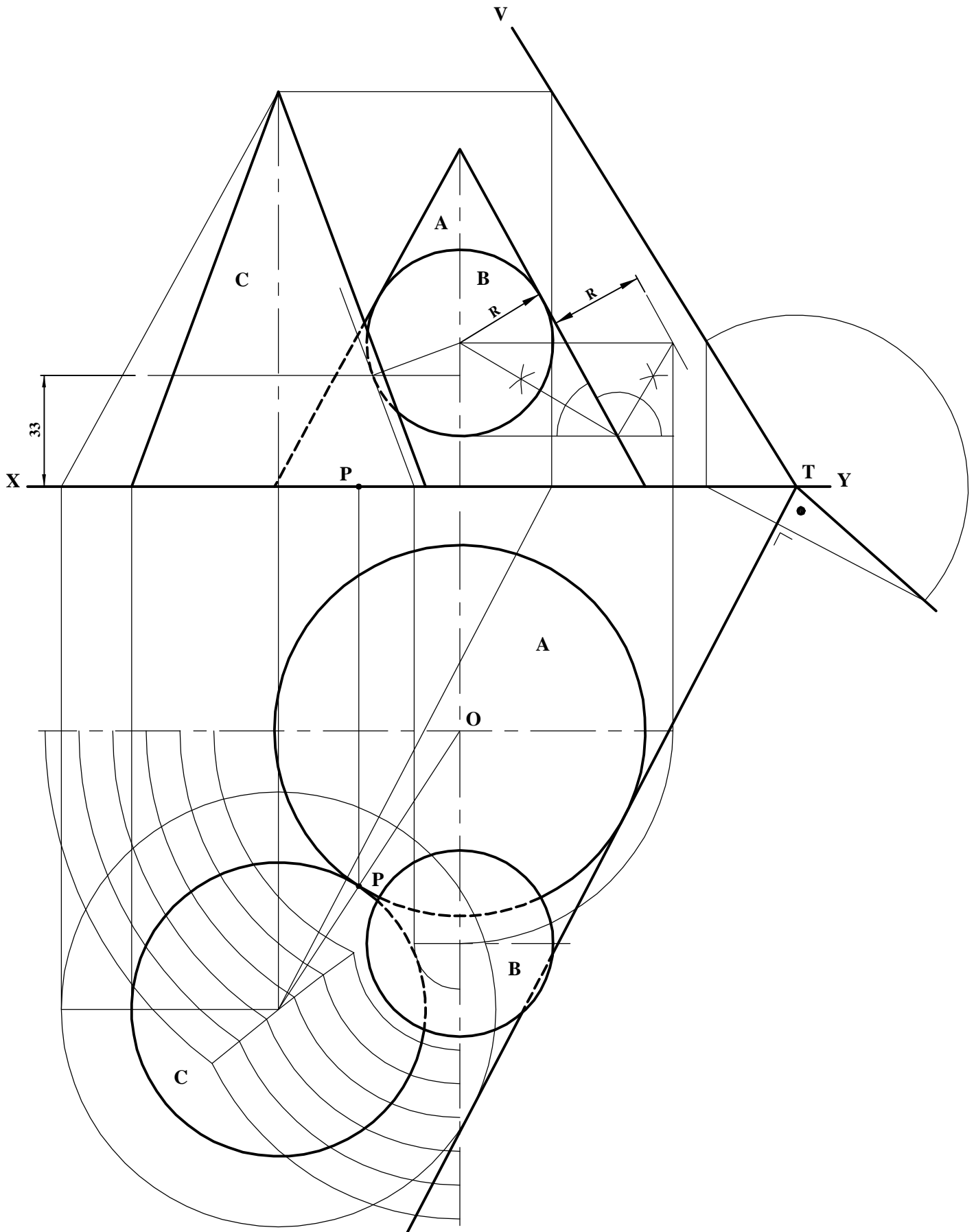
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.


MARKING SCHEME.

QUESTION 2(c).

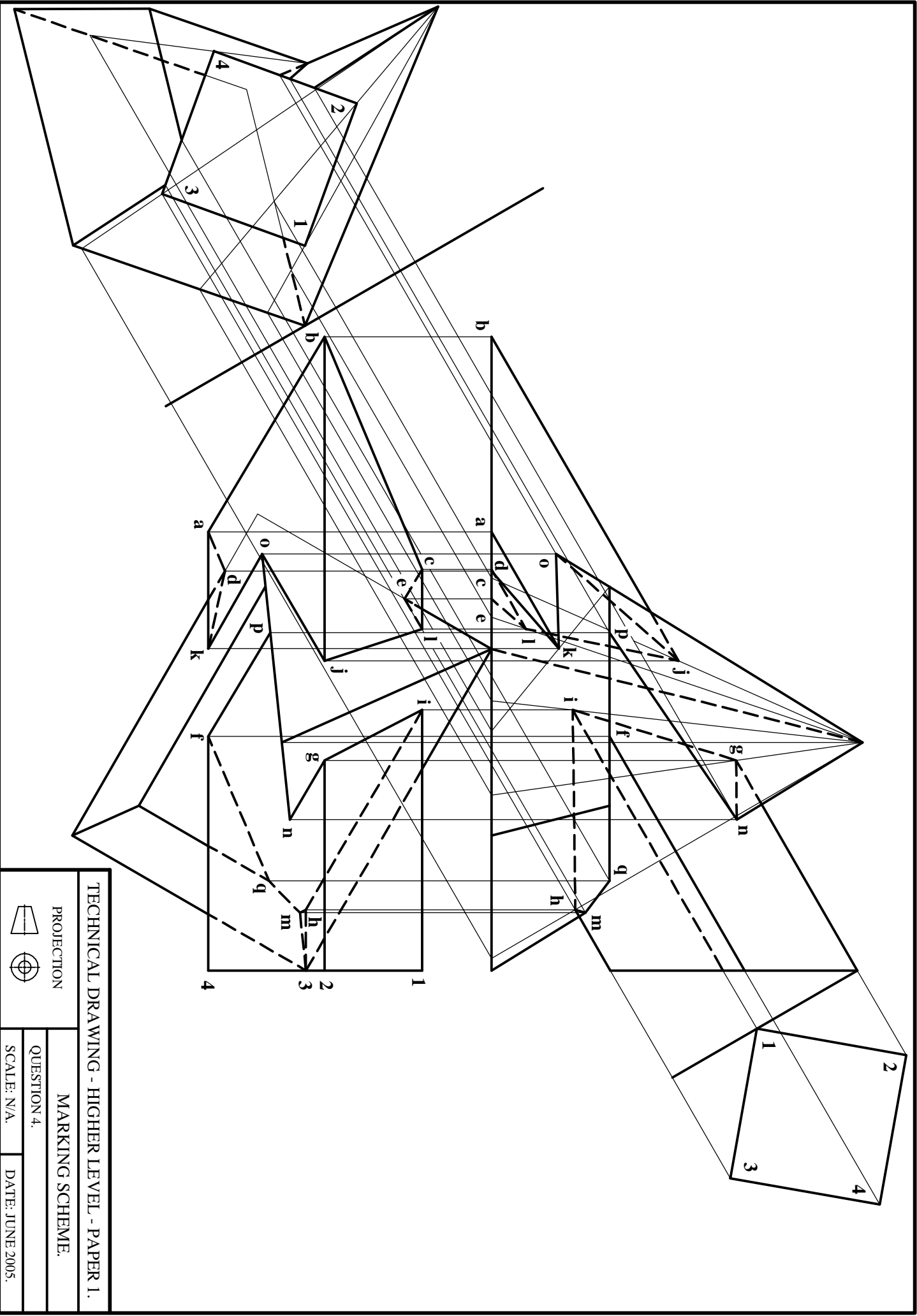
SCALE: N/A.

DATE: JUNE 2005.



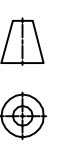
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.	
PROJECTION	MARKING SCHEME.
	QUESTION 3.
SCALE: N/A	DATE: JUNE 2005





TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

PROJECTION

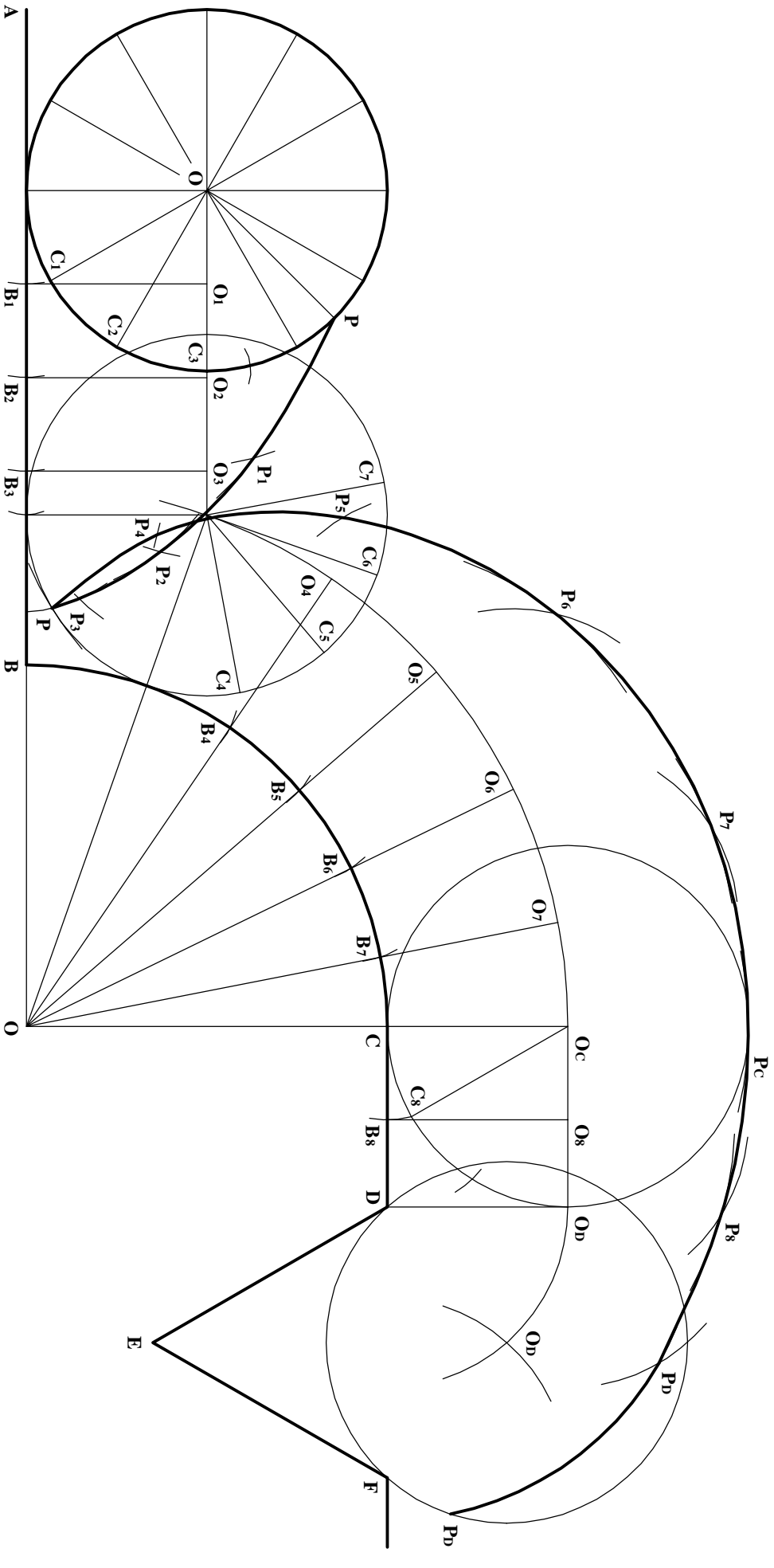


MARKING SCHEME.

QUESTION 4.

SCALE: N/A.

DATE: JUNE 2005.



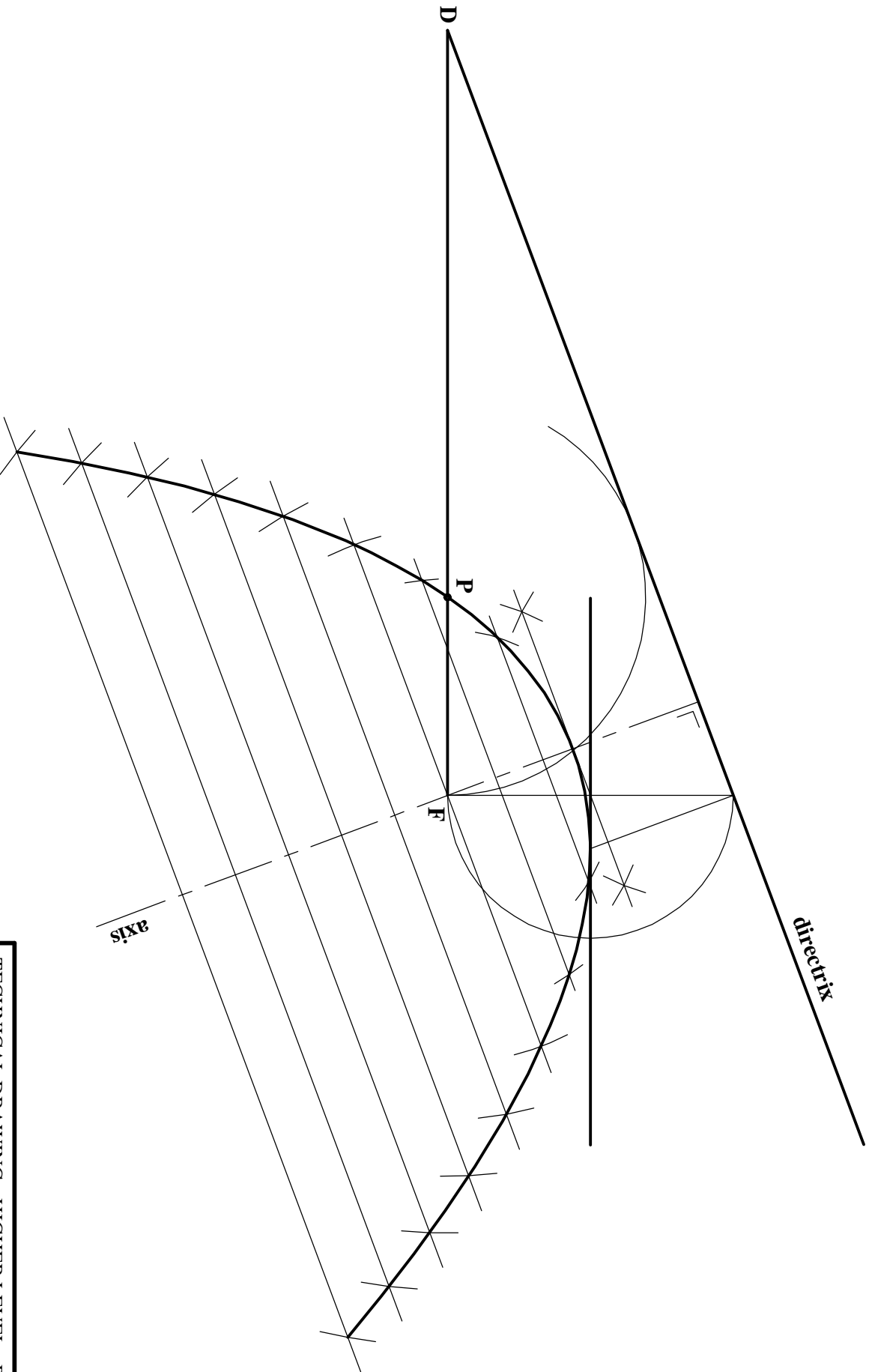
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

MARKING SCHEME.

QUESTION 5.

SCALE: N/A

DATE: JUNE 2005.



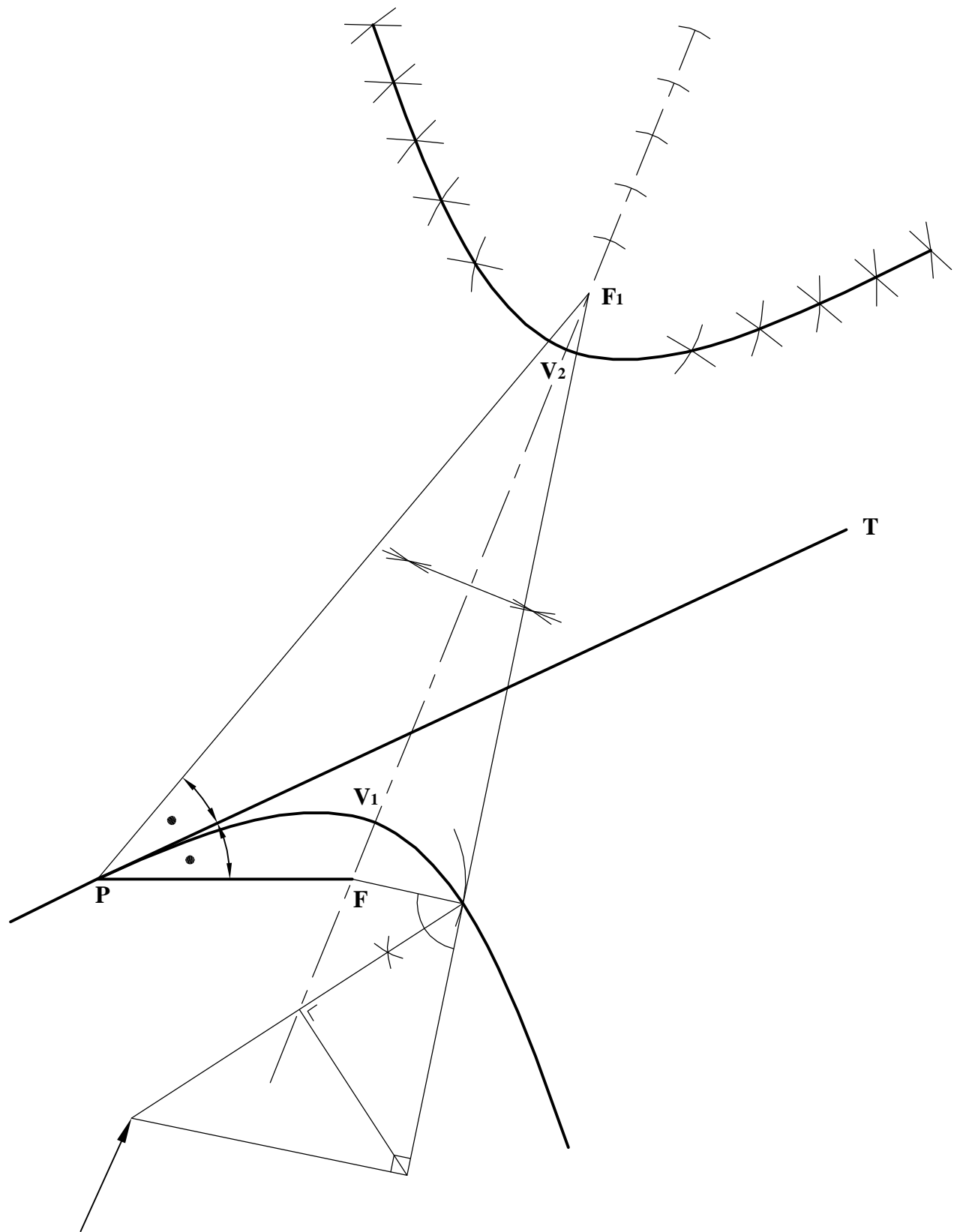
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

MARKING SCHEME.

QUESTION 6(a).

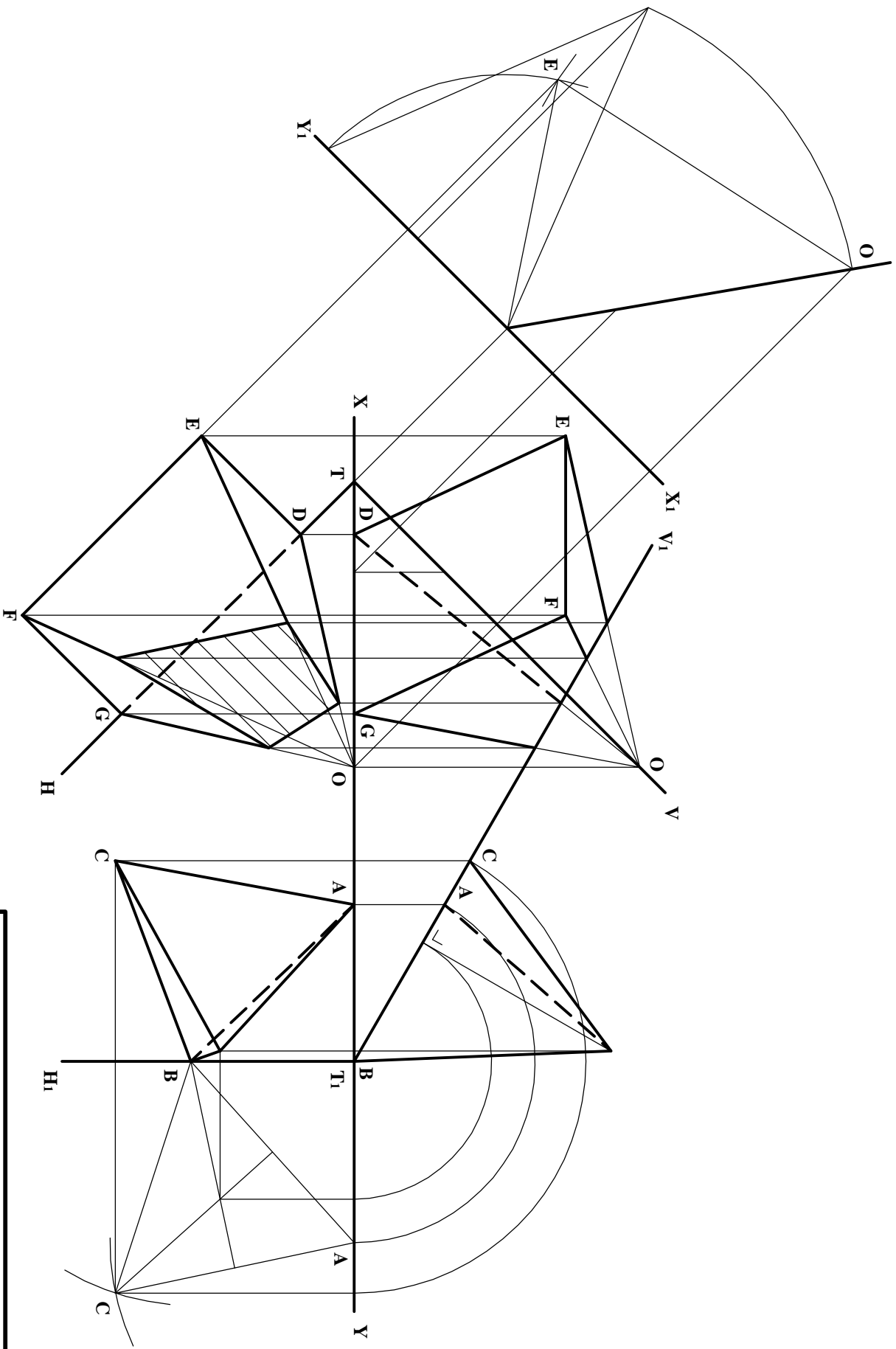
SCALE: 1:1.

DATE: JUNE 2005.



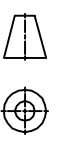
centre of curvature

TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.	
MARKING SCHEME.	
QUESTION 6(b).	
SCALE: 1:1	DATE: JUNE 2005.



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

PROJECTION



MARKING SCHEME.

QUESTION 7.

SCALE: N/A.

DATE: JUNE 2005.

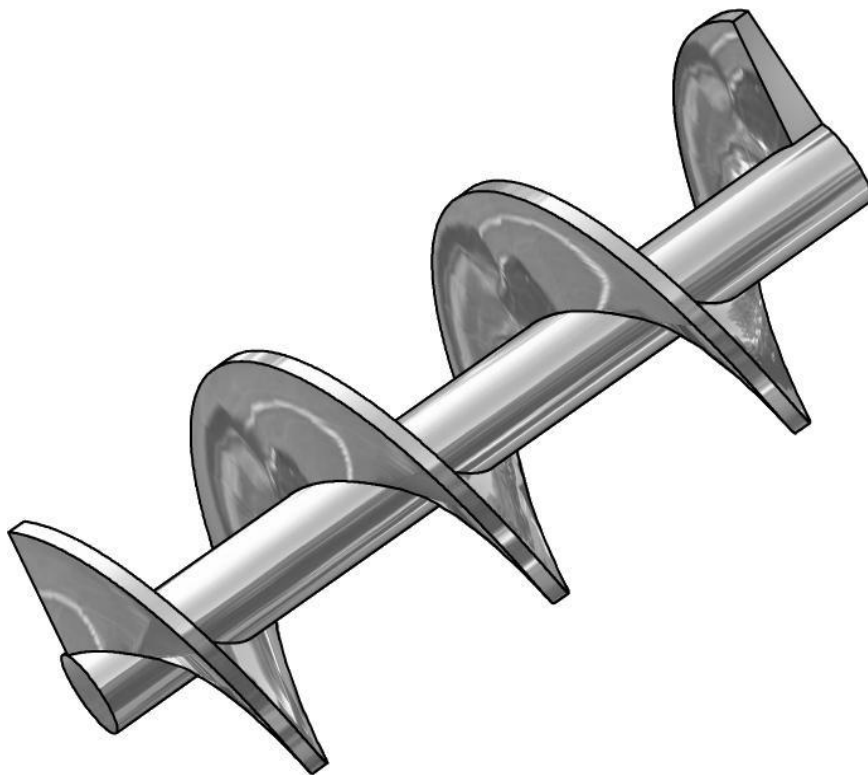


**Coimisiún na Scrúduithe Stáit**  
*State Examinations Commission*

---

*Leaving Certificate Examination 2005*

***Technical Drawing***  
***Paper 2A - Higher Level***  
***(Engineering Applications)***



***Marking Scheme***  
***and Sample Solutions***

*(Other valid solutions are acceptable and marked accordingly)*

## MARKING SCHEME: QUESTION 1

(a)	ASSEMBLY	7
(b)	SECTIONAL ELEVATION A-A	25
(c)	ADDITIONAL REQUIREMENTS	12
(d)	MODIFICATION	<u>6</u>
	<b>TOTAL</b>	<b>50 Marks</b>

<b>ASSEMBLY</b>	<b>(7)</b>	<b>NUT</b>	<b>2</b>
Spindle in base	1	Three faces on nut	1
Clamp in position	1	Curves on faces	1
Adjusting nut on spindle	1		
Tommy bars in adjusting nut	1	<b>SUPPORT ROLLER</b>	<b>2</b>
Roller in bracket on spindle	1	Roller outline	1
Nut and washer on spindle	1	Ø12 mm ends	1
Lowest position	1		
		<b>ADDITIONAL REQUIREMENTS (12)</b>	
<b>SECTIONAL ELEVATION</b>	<b>(25)</b>	Centre lines	1
		Hatching of components	3
<b>BASE</b>	<b>6</b>	Parts item referenced (Leaders; Terminations; Numbers)	3
Base outline	2	Title supplied	2
Internal detail	2	(G=1; Ex=2)	
Slot and lug	1	Overall presentation	3
Fillets	1	(F=1; G=2; Ex=3)	
<b>SPINDLE</b>	<b>3</b>	<b>MODIFICATION</b>	<b>(6)</b>
M12 thread convention & chamfer	1	Suitable method suggested	2
Ø15 mm x 20 mm area	1	Method shown in sketch	2
M20 thread convention & chamfer	1	Sketch presentation	2
		(G=1; Ex=2)	
<b>SUPPORT CLAMP</b>	<b>2</b>		
M8 thread convention/area hatched	1		
Handle	1		
<b>ADJUSTING NUT</b>	<b>3</b>		
Outline & chamfers	1		
Threaded holes	2		
<b>TOMMY BAR</b>	<b>2</b>		
Left and right bars	2		
<b>ROLLER BRACKET</b>	<b>4</b>		
Support areas	2		
Webs/boss	1		
Fillets	1		
<b>WASHER</b>	<b>1</b>		
Washer outline	1		

**MARKING SCHEME: QUESTION 2**

(a)	CAM & DISPLACEMENT DIAGRAM	30
(b)	MECHANISM	<u>20</u>
	TOTAL	50 Marks

<b>CAM</b>	<b>(30)</b>	<b>MECHANISM</b>	<b>(20)</b>
<b>DISPLACEMENT DIAGRAM</b>	<b>12</b>	<b>LAYOUT</b>	<b>4</b>
Twelve appropriate divisions	1	Centre lines	1
Correct heights	1	Cranks AB & CD	1
U.A.R construction	2	Link AC	1
U.A.R curve drawn & correct	1	Link BE	1
Dwell	1		
S.H.M construction	2		
S.H.M curve drawn & correct	1	<b>LOCUS</b>	<b>11</b>
U.V	1	Circle OA divided into 12 parts	1
Identification system	1	Rotation OA correct	1
Presentation	1	Location of points C on arc DC	2
		Location of points B	2
		Locus drawn & correct	2
<b>CAM PROFILE</b>	<b>18</b>	Indexing	1
Rotation correct	2	Presentation	2
Angular divisions 0 <sup>0</sup> to 360 <sup>0</sup>	1		
Intermediate angles used	1	<b>DIMENSIONING</b>	<b>5</b>
Nearest approach correct	1	Location of points E (min/max)	1
Heights projected and swung	1	Stroke of piston E 30 ±2 mm	1
Roller followers drawn	2	Dimension	1
U.A.R drawn/correct	1	Angle of travel DC 53 <sup>0</sup> ±2 <sup>0</sup>	1
Dwell arc drawn/correct	1	Dimension	1
S.H.M drawn/correct	2		
U.V drawn/correct	2		
Camshaft	1		
Identification system	1		
Presentation	2		



**MARKING SCHEME: QUESTION 3**

(a)	COMPLETED VIEWS	9
(b)	TRUE LENGTHS	12
(c)	DEVELOPMENT	22
(d)	TRUE SHAPE OF TOP OPENING	7
	TOTAL	50 Marks

**COMPLETED VIEWS (9)**

Elevation as given	2
Plan as given	2
Division of semi-circle elevation	1
Division of semi-circle plan	1
Intersection of points	1
Intersection curve drawn/correct	1
Presentation	1

**TRUE LENGTHS (12)**

Surface divided into triangles	1
True lengths obtained/identified	8
T/L layout	2
Identification system	1

**DEVELOPMENT (22)**

Cylinder divisions	1
Cylinder heights projected	1
Curve drawn/correct	1
Cut out widths	1
Cut out heights	1
Hole drawn/correct	1
Triangular area correct (10 triangles)	10
One piece development	1
Seam correct	2
Identification system	1
Presentation	2

**TRUE SHAPE OF TOP (7)**

Projection of lengths from elevation	1
Correct widths from plan	2
Intersection points	1
Curve drawn	1
Rectangle drawn	1
Presentation	1

### MARKING SCHEME: QUESTION 4

(a)	MACHINE DRAWING	42
(b)	ADDITIONAL REQUIREMENTS	<u>8</u>
	TOTAL	50 Marks

#### MACHINE DRAWING (42)

<b>SECTIONAL ELEVATION</b>	<b>16</b>	<b>END ELEVATION</b>	<b>10</b>
Centre lines	1	Projected correctly	2
M50 threaded hole/ convention	1	Centre lines	1
Ø30 mm hole & chamfer	1	Flange area	1
Ø80 mm cylinder areas	1	Ø60 mm x 30mm pipe	1
Ø40 mm hole	1	Ø 80 mm x 90 mm cylinder	1
Top & bottom wall thickness	1	Ø80 mm x 15 mm area	1
Ø60 mm x 5 mm counter bore	1	Web	1
M40 threaded hole/ convention	1	Fillets	1
Ø80 mm cylinder areas	1	Presentation	1
Web	1		
Ø150 mm flange & holes	1		
Fillets	1	<b>ADDITIONAL REQUIREMENTS (8)</b>	
Correct areas hatched	2	(i) Four dimensions	4
Presentation	2	(ii) Projection symbol	2
		(iii) Title: Valve Housing	2

<b>SECTIONAL PLAN</b>	<b>16</b>
Projected correctly	1
Centre lines	1
Ø30 mm hole	1
Ø40 mm chamfer circle	1
Chest outline	1
Chest wall thickness	1
Ø 60 mm pipe	1
Ø40 mm bore	1
Ø150 mm flange	1
Two Ø10 mm holes	1
Fillets	1
Hidden detail/ surface lines removed	1
Correct areas hatched	2
Presentation	2

**MARKING SCHEME: QUESTION 5**

(a)	PARTS LIST	12
(b)	PISTON ASSEMBLY	10
(c)	ISOMETRIC DRAWING	<u>28</u>
Total		50 Marks

<b>PARTS LIST</b>	<b>(12)</b>	<b>ISOMETRIC DRAWING</b>	<b>(28)</b>
Parts list drawn	1	<b>BRACKET</b>	<b>9</b>
10 parts identified (1 mark each)	10	Back plate	1
Presentation / lettering	1	Ø 15 mm hole	1
		Ø 20 mm holes	1
		Top profile	2
<b>PISTON ASSEMBLY</b>	<b>(10)</b>	Other profiles	3
<b>PISTON</b>	<b>6</b>	M8 threaded hole	1
Piston profile	3		
Piston rings	1	<b>TEE BOLT</b>	<b>3</b>
Gudgeon pin	1	Head	1
Connecting rod	1	Bolt shank & threads	1
		Isometric circle	1
<b>SKETCH DETAIL</b>	<b>4</b>	<b>SPHERICAL LEVER</b>	<b>5</b>
Sectional freehand sketch provided	1	Sphere	1
Correct areas hatched	1	Shaft outline	1
Sketch presentation	2	Shaft isometric circle	1
(G=1; Ex=2)		Flat surface	1
		Flat isometric arcs	1
		<b>VIEW DETAILS</b>	<b>10</b>
		Isometric drawing provided	1
		Correct viewpoint	1
		Isometric scale	2
		Method of assembly shown	1
		Construction for isometric circles	2
		Centre lines	1
		Presentation	2
		(G=1; Ex=2)	

**MARKING SCHEME: QUESTION 6A**

(a)	SPUR GEAR DRAWING	25
(b)	FEED SCREW	<u>25</u>
	TOTAL	50 Marks

<b>SPUR GEAR DRAWING</b>	<b>(25)</b>	<b>FEED SCREW</b>	<b>(25)</b>
<b>SPUR GEAR CALCULATIONS</b>	<b>9</b>	<b>LAYOUT</b>	<b>10</b>
Calculations and formulae shown	1	Centre line	1
Number of teeth	1	Screw profile	1
Module	1	Outside diameter	1
Addendum	1	Root diameter	1
Dedendum	1	Division of circles	1
Pitch circle	1	Divisions of pitches	1
Circular pitch	1	Projection lines for crest	1
Tooth thickness	1	Projection lines for root	1
Presentation	1	Crest helix obtained	1
		Root helix obtained	1
 <b>SPUR GEAR TEETH</b>	 <b>16</b>	 <b>THREAD PROFILE</b>	 <b>15</b>
Centre lines	1	Front crest curves drawn (4 off)	4
PCD	1	Back crest curves drawn (short)	2
Addendum circle	1	Root curves drawn	2
Dedendum circle	1	Crest flats drawn	2
Base circle	1	Root flats drawn	2
Tangent (calculation) for base circle	1	Presentation	3
Tooth thickness	1	(F=1; G=2; Ex=3)	
Construction of tooth profile (involute curve or any recognised approximate method acceptable)	3		
Root radii drawn	1		
Second tooth drawn	2		
Presentation	3		
(F=1; G=2; Ex=3)			

**MARKING SCHEME: QUESTION 6B**

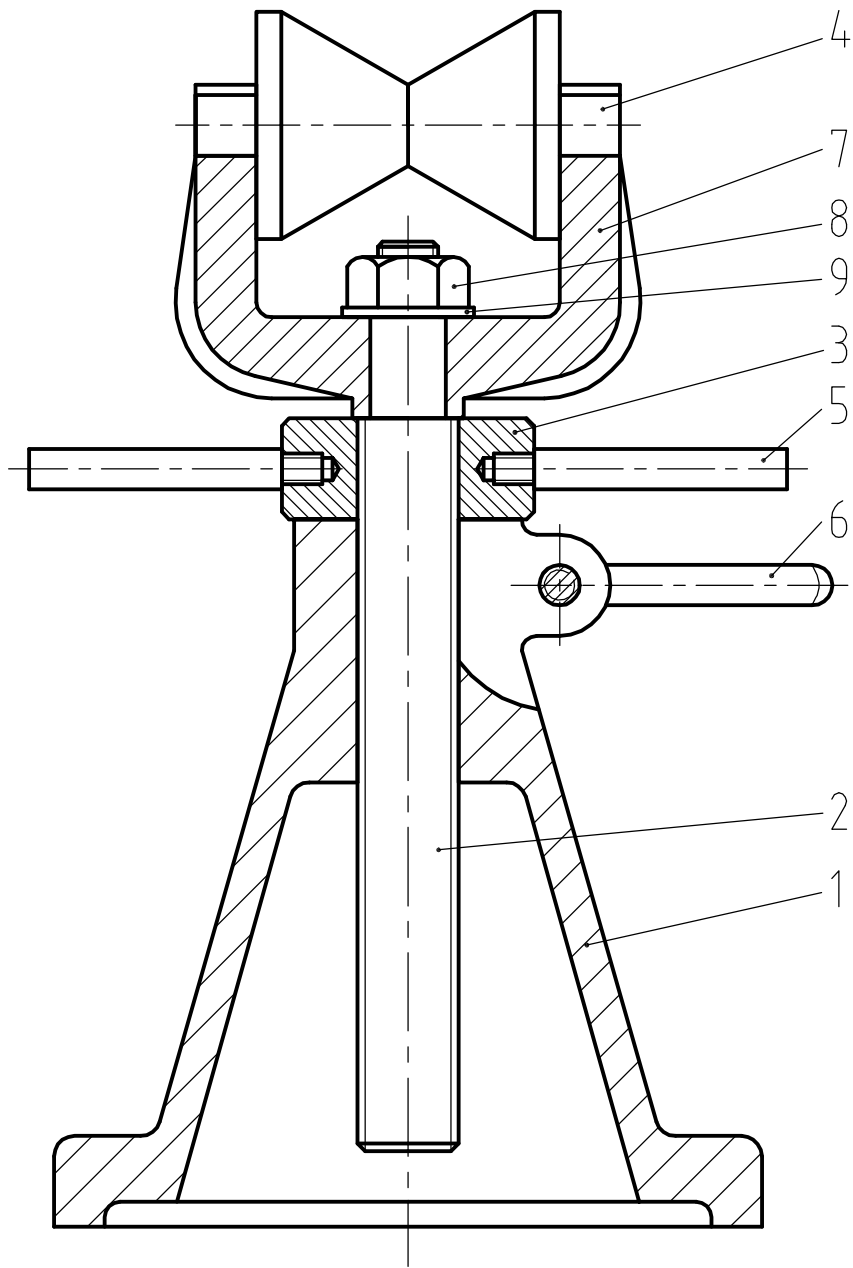
(a)	SHORT CAD QUESTIONS	12
(b)	CANDLESTICK MODEL	11
(c)	CAD COMMAND PAIRS	15
(d)	CAD PROFILE	<u>12</u>
	Total	50 Marks

		5		
<b>SHORT CAD QUESTIONS</b>	<b>(12)</b>		<b>CAD PROFILE</b>	<b>(12)</b>
(i)	Two editing & two viewing commands	2	Sheet size	1
			Circles	1
			Three lines	2
(ii)	Aliasing explained	2	Array	1
			End lines	1
(iii)	Vector graphics	2	Top/ Bottom lines	1
			Extend	1
(iv)	Text obliquing angle	2	Trim	1
			Filletts	1
(v)	Baseline dimensioning	2	Presentation	2
(vi)	Absolute coordinate	2		
(vii)	Text width factor	2		
(viii)	Two advantages of USB memory	2		

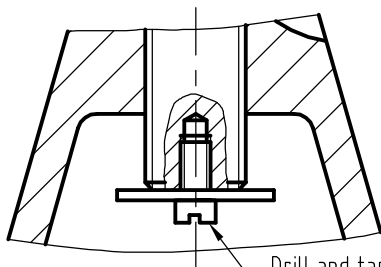
*Maximum 12 marks*

<b>CANDLESTICK MODEL</b>	<b>(11)</b>
CAD package	1
Commands used to draw the model	10
(Explanation 5)	
(Sketches 5)	

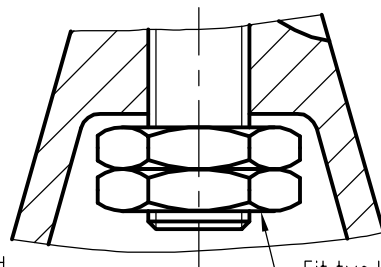
<b>CAD COMMAND PAIRS</b>	<b>(15)</b>
(i) Polar/Rectangular array	3
(ii) Spline/Fit	3
(iii) Associative/Non associative hatching	3
(iv) Pan/Move	3
(v) Rotate/Revolve	3



ADJUSTABLE PULLEY

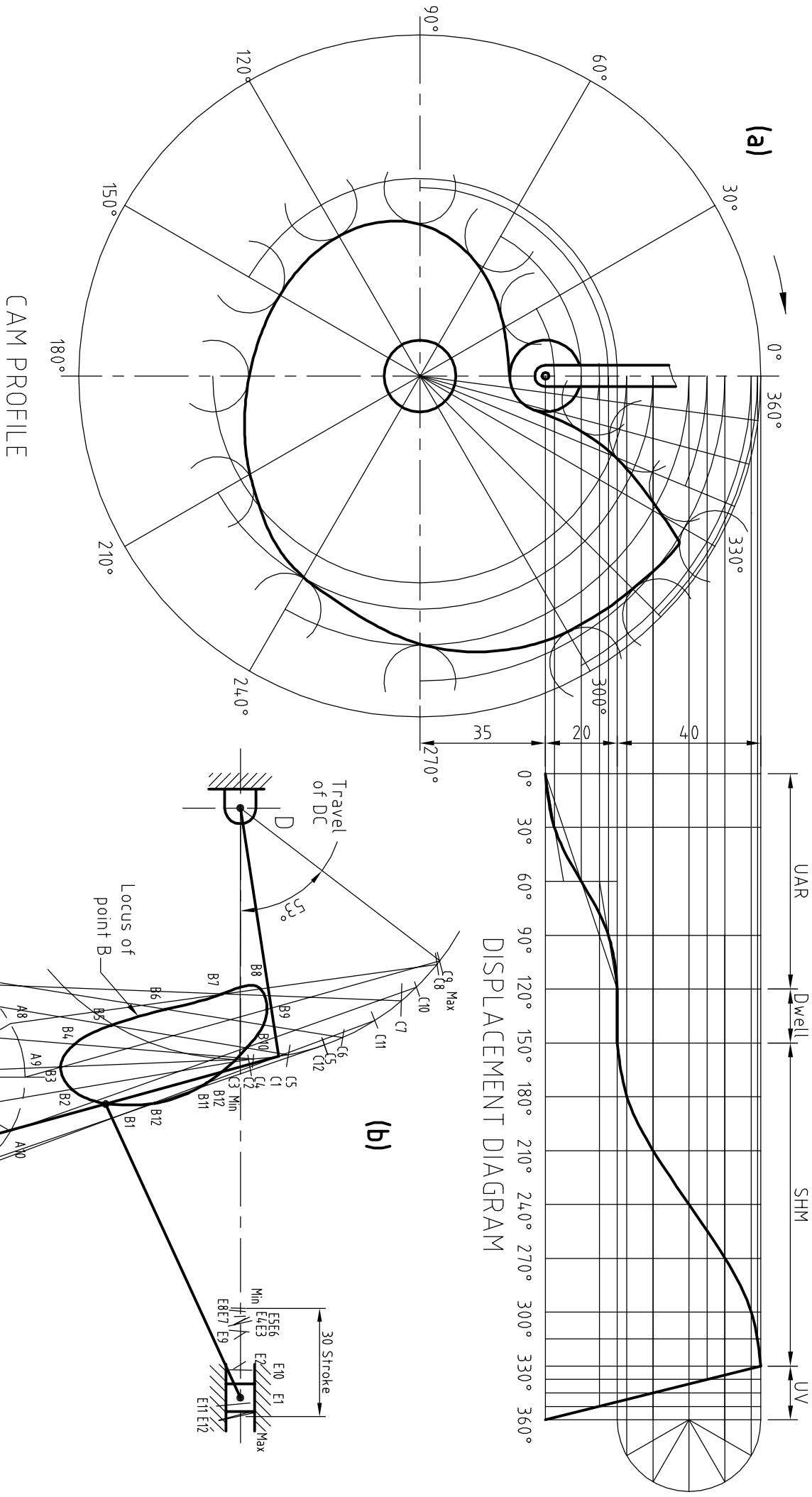


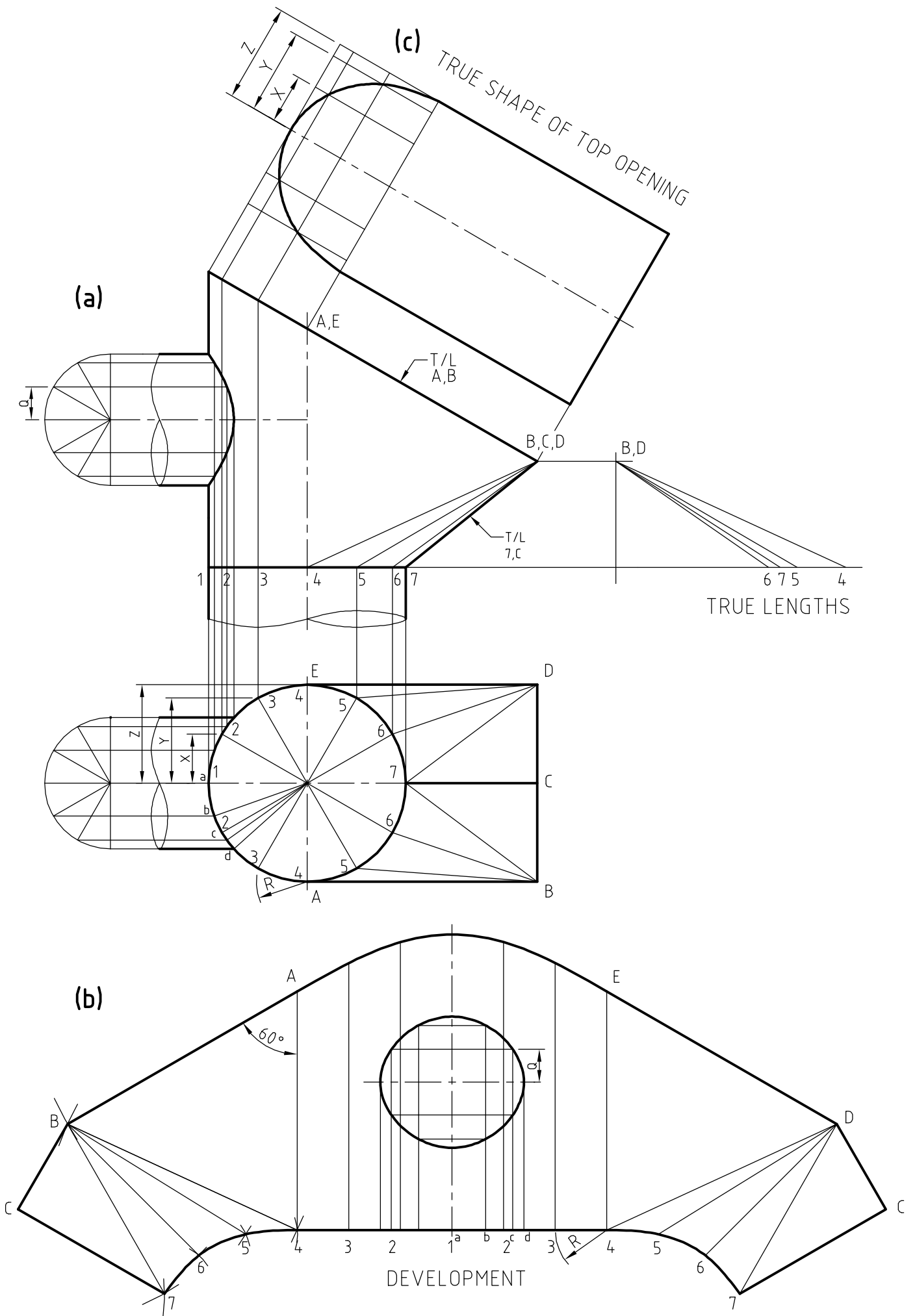
Drill and tap spindle and fit a stop washer and screw.



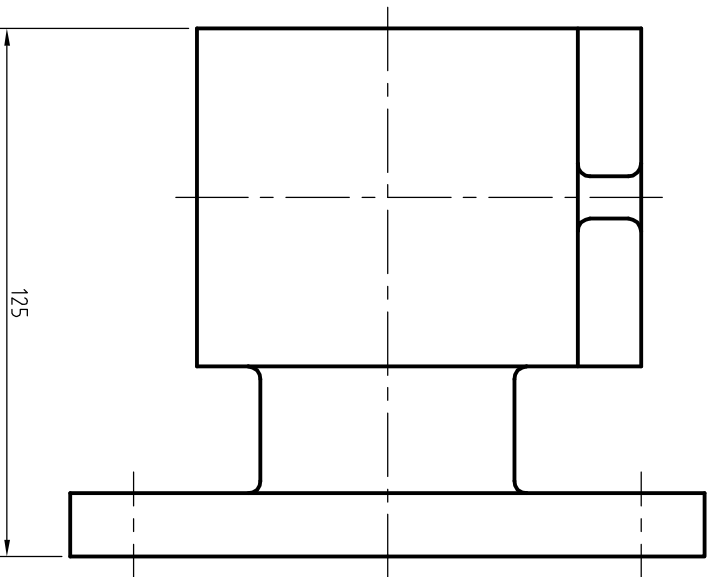
Fit two lock nuts. Other methods such as pins, circlip etc are also acceptable.

MODIFICATION

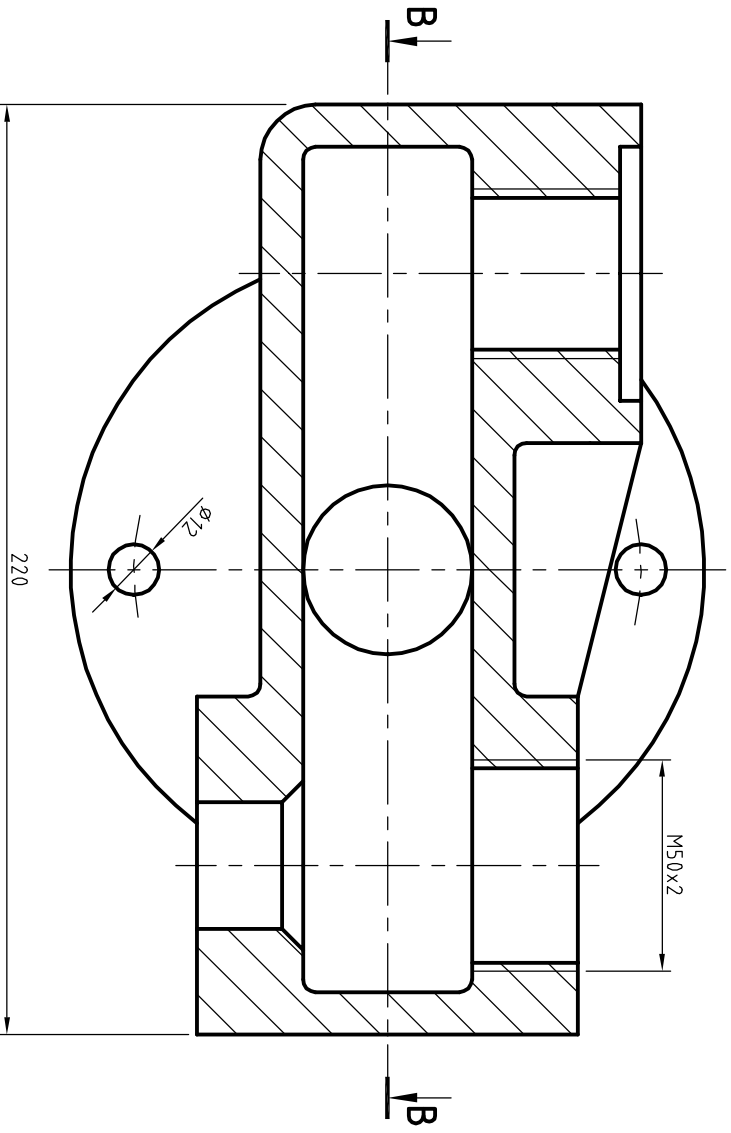




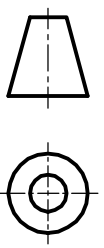




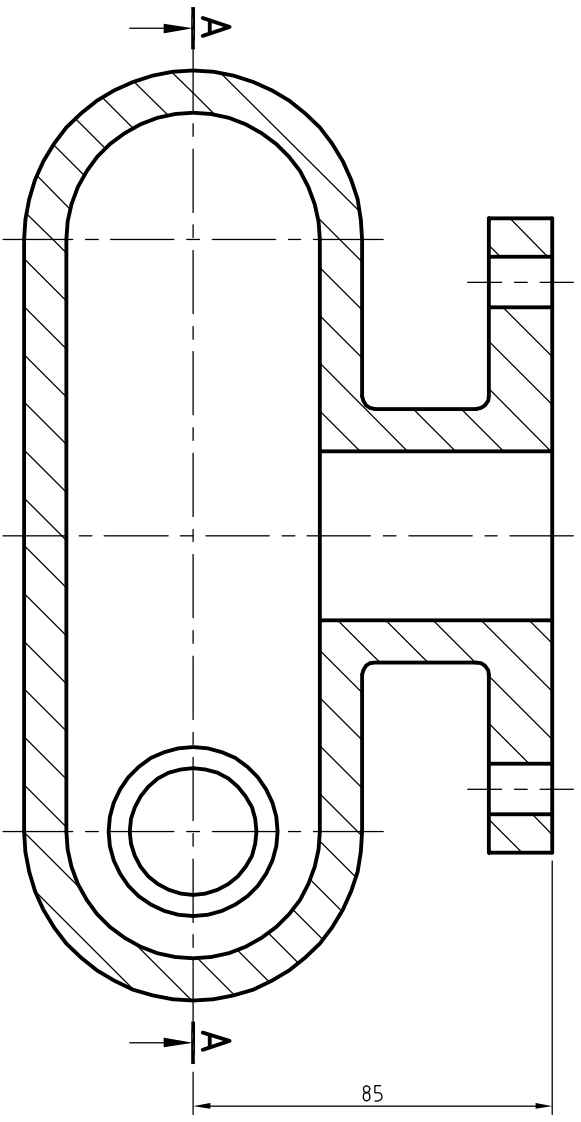
END ELEVATION



SECTION A-A



VALVE HOUSING

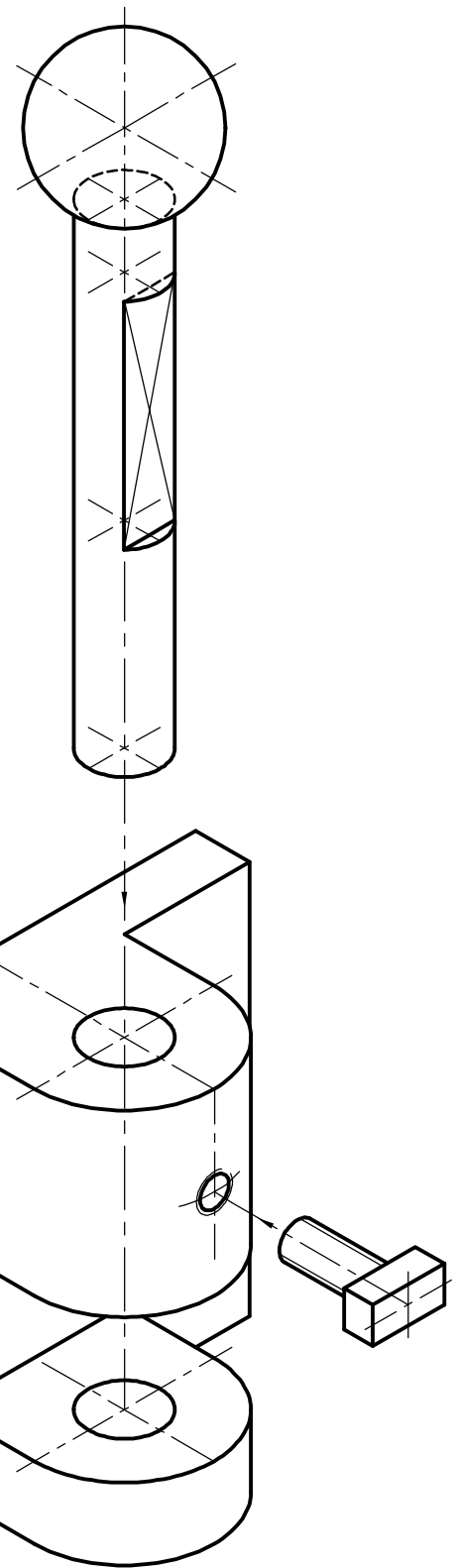


SECTION B-B

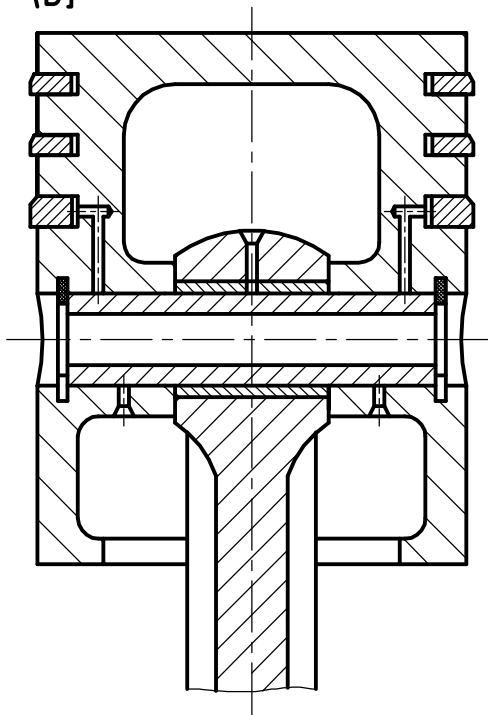
(a)

10	Oil Sump
9	Crankshaft
8	Oil Drain Plug
7	Flywheel
6	Starter Motor
5	Cylinder Head
4	Piston
3	Jockey (Idler) Pulley
2	Overhead Cam
1	Timing Belt
ITEM	NAME

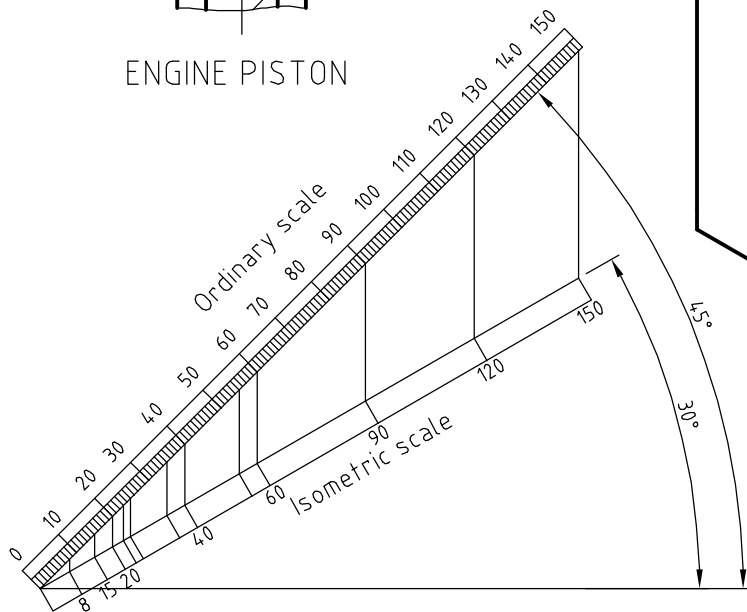
(c)



(b)

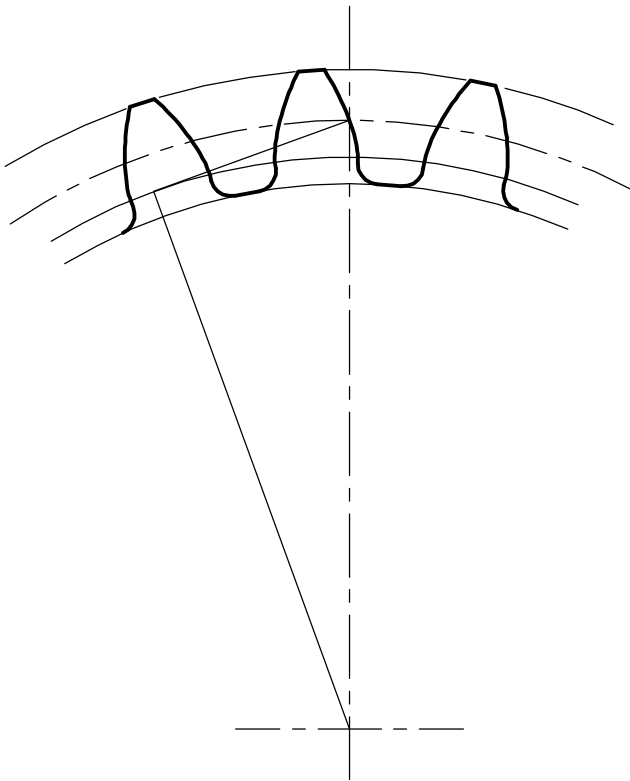


ENGINE PISTON

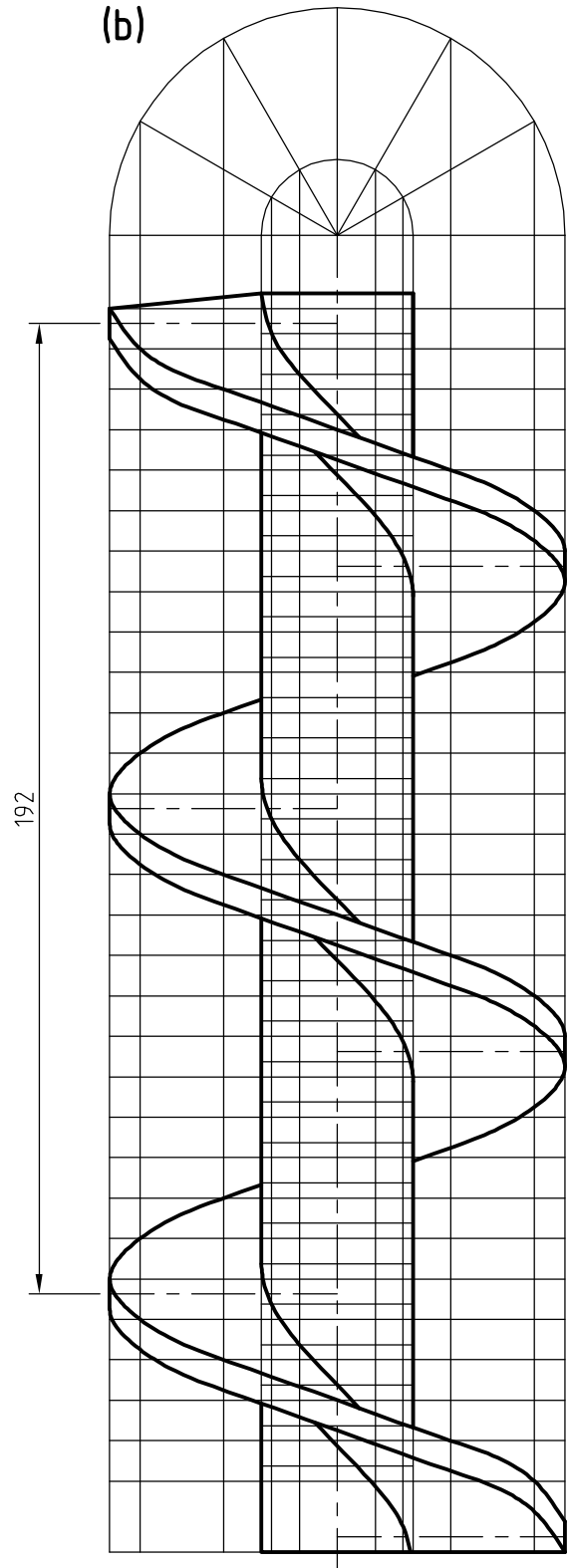


Isometric scale =  $\frac{\sqrt{2}}{3}$  times true size (0.816)

(a)



(b)



### CALCULATIONS

100 RPM : 50 RPM

Gear Ratio 2 : 1

(i) No teeth =  $12 \times 2 = 24$

(ii) Module =  $PCD/T = 120/12 = 10$

(iii) Addendum = module = 10mm

(iv) Dedendum =  $1.25 \times \text{module} = 1.25 \times 10 = 12.5\text{mm}$

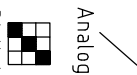
(v) PCD =  $m \times T = 10 \times 24 = 240\text{mm}$

(vi) Circular pitch =  $\pi \times m = 3.142 \times 10 = 31.42\text{mm}$

(vii) Tooth thickness =  $CP/2 = 31.42/2 = 15.71\text{mm}$

**(a)** (i) Editing Commands: Undo, Copy, Cut etc  
Viewing Commands: Zoom, Pan, 3D Views etc

(ii) Aliasing happens when analog data (lines/curves) are represented on a digital system. Diagonal lines appear choppy across a set of pixels 'staircasing effect':

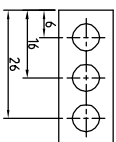


(iii) In vector graphics the CAD drawing/file is created and saved as a sequence of vector statements (mathematical statements/geometrical formulas). For example instead of containing a bit in the file for each bit of a line (bitmap), a vector graphics file a 'vector' describes the series of points to be connected. This results in a smaller file size. Vector graphics can be scaled without any loss in resolution.

(iv) Effect of changing obliquing angle:

Exam Exam Exam

(v) Baseline dimensioning.



(vi) Absolute coordinates of end point: 0,0

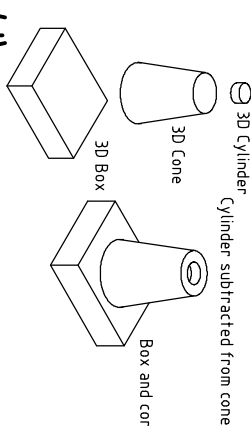
(vii) Effects of changing Text Width Factor

Exam Exam Exam

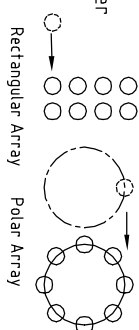
(viii) Advantages of USB memory sticks: (i) Larger storage capacity (16MB to 6GB of data as against 1.44MB for a floppy). (ii) More reliable and robust (solid state flash memory – floppy magnetic storage prone to physical damage and corruption of data); (iii) Smaller in size. (iv) Faster than a floppy disk. (v) No moving parts.

**(b)** Package: AutoCAD 2006 (or a parametric modeller)

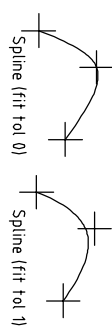
- Step 1: Set up drawing (sheet size, drafting settings, layers, 3D environment, viewpoints, UCS etc)
- Step 2: Draw 3D Box (Enter: length, width, height)
- Draw 3D Cone (Enter: base dia, top dia, height)
- Draw 3D Cylinder (Enter: diameter, height).
- Step 3: Move 3 primitives to correct position (osnap, move).
- Step 4: Union box and cone then subtract cylinder.
- Step 5: Save and print.



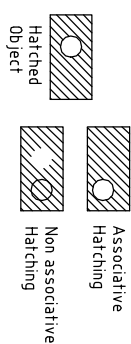
**(c)** (i) RECTANGULAR ARRAY creates an array defined by a number of rows and columns of copies of the selected object. POLAR ARRAY creates an array by copying the selected object around a circular point.



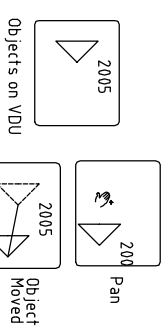
(ii) SPLINE draws a smooth curve to a sequence of points. FIT option draws the spline within a certain distance (tolerance) of the selected points. With a Fit tolerance of 0 spline passes through all vertices. A Fit tolerance greater than zero allows the spline curve to pass through the fit points within the specified tolerance.



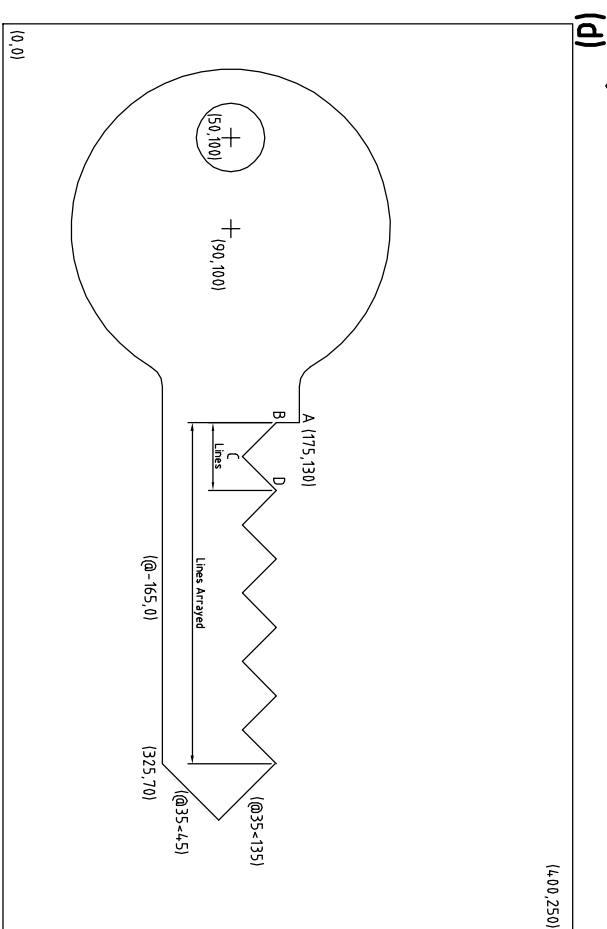
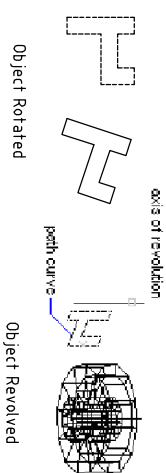
(iii) ASSOCIATIVE hatch updates when its boundaries are modified. By moving the circle the hatching changes. A NONASSOCIATIVE hatch is independent of its boundaries. By moving the circle the hatching does not change.



(v) PAN changes the view of the drawing. It does not change the location or magnification of objects on the drawing. MOVE displaces objects a specified distance in a specified direction.



(iv) ROTATE moves an object about a base point. REVOLVE creates a revolved surface/solid about a selected axis.





**Coimisiún na Scrúduithe Stáit**  
***State Examinations Commission***

---

*Leaving Certificate Examination 2005*

***Technical Drawing***  
***Paper 2B - Higher Level***  
***(Building Applications)***



***Marking Scheme***  
***And Sample Solutions***

(Other valid solutions are acceptable and marked accordingly)

## QUESTION 1

	<b>MARKS</b>
1. Draw the given plan .....	<b>2</b>
2. Position spectator and plan of picture plane.....	<b>2</b>
3. Plan of vanishing points .....	<b>2</b>
4. Ground line, horizon line, vanishing points in elevation (1, 1, 2) .....	<b>4</b>
5. Projection lines from plan to spectator.....	<b>1</b>
6. Perspective of base lines of structure (3, 3) .....	<b>6</b>
7. Measure height 1 and complete perspective of base (2, 2) .....	<b>4</b>
8. Determine base lines of main structure and measure height 2 (2, 1) .....	<b>3</b>
9. Measure height 3, construction for determining points on curves (1, 4) ..	<b>5</b>
10 Complete persp. view of main structure (excluding holes), presentation.	<b>6</b>
11. Determine auxiliary vanishing point (or alternative) .....	<b>5</b>
12. Measure and apply heights for inclined lines .....	<b>4</b>
13. Draw lines in perspective vanishing to AVP .....	<b>3</b>
14. Complete perspective view, presentation.....	<b>3</b>
	<b>TOTAL... 50</b>

## QUESTION 2

<b>Part (a) Roof surfaces A and B (23)</b>	<b>MARKS</b>
1. Set up given outline and dimensions in plan.....	2
2. Draw edge views of surfaces A and B (3, 3).....	6
3. Determine line of intersection between roof surfaces in plan.....	4
4. Complete plan and elevation of roof surfaces A and B (2, 2).....	4
5. View showing true length of line of intersection between A and B .....	4
6. Construction to find dihedral angle.....	4
7. Indicating dihedral angle.....	1
 <b>Part (b) Roof surfaces C, D, E and F (18)</b>	
8. Construction to draw line of intersection between C and E(1,2,2).....	5
9. Complete plan and elevation of surfaces C and E.....	2
10. View showing true length of line of intersection between A and D .....	4
11. Construction to determine trace of surface D in plan .....	5
12. Complete plan and elevation of roof.....	2
 <b>Part (c) Development of surface C (7)</b>	
13. Construction to determine true widths for development.....	5
14. Draw development of surface C.....	2
<b>TOTAL... 50</b>	

## QUESTION 3

<b>Given Plan and Elevation (8)</b>	<b>MARKS</b>
1. Draw the given plan and elevation.....	<b>6</b>
2. Draw light rays in plan and elevation.....	<b>2</b>
<b>Plan (34)</b>	
3. Draw outline plan of shadow cast on ground by building A .....	<b>4</b>
4. Construction to determine shadow cast by building B on ground .....	<b>7</b>
5. Draw curved shadows C and D on ground (2, 3).....	<b>5</b>
6. Complete shadows cast on ground, presentation... ..	<b>4</b>
7. Construction to determine area of shade on building B in plan.....	<b>4</b>
8. Complete area of shade in plan .....	<b>2</b>
9. Construction to determine shadow cast by building A on building B .....	<b>4</b>
10. Complete shadow on building B in plan, presentation .....	<b>4</b>
<b>Elevation (8)</b>	
11. Construction to determine shadow cast by building A on building B .....	<b>4</b>
12. Complete shadow in elevation, presentation.....	<b>4</b>
<b>Total...</b>	<b>50</b>



## QUESTION 4

<b>Setting up Plan (9)</b>	<b>MARKS</b>
1. Set up given dimensions in plan.....	2
2. Set up construction for parabola ABC .....	5
3. Draw parabola ABC .....	2
<b>Setting up Elevation (9)</b>	
4. Set up given dimensions in elevation, draw circular arc.....	2
5. Set up construction for parabola BD .....	5
6. Draw parabola BD.....	2
<b>Curve M in Plan (17)</b>	
7. Draw horizontal sections in elevation.....	3
8. Measure lengths (e.g. P) from elevation on translating parabola in plan..	5
9. Determine points on curve M in plan.....	5
10. Complete plan of structure, presentation.....	4
<b>Curve N in Elevation (15)</b>	
11. Measure dist. (e.g. X) from centre line of hole to curve DB in elev.....	4
12. Transfer these distances to plan and draw circles to int. parabola ABC...	4
13. Measure dist (e.g.Y) from plan to elev. to determine points on curve N..	3
14. Complete elevation, presentation .....	4
<b>Total ... 50</b>	

## QUESTION 5

<b>(a) Set up, Dip, Strike &amp; Thickness of Stratum (38)</b>	<b>MARKS</b>
1. Outline of bore-holes in plan, points A and B in elevation.....	<b>6</b>
2. Bore-hole A in elevation, points 1 and 3 in elevation and plan (3, 2, 2) ..	<b>7</b>
3. Bore-hole B in elevation, points 2 and 4 in elevation and plan (3, 2, 2)...	<b>7</b>
4. Draw lines 1, 2 and 3, 4 on headwall and footwall in plan (1, 1) .....	<b>2</b>
5. Draw lines 1, 2 and 3, 4 on headwall and footwall in elevation (1, 1) .....	<b>2</b>
6. Determine a plane parallel to line in elevation.....	<b>3</b>
7. Determine this plane in plan.....	<b>3</b>
8. Determine the strike in plan .....	<b>3</b>
9. Direction of auxiliary elevation, dip and thickness (1, 2, 2).....	<b>5</b>
<b>(b) Altitude at which bore-hole reaches top surface of stratum (8)</b>	
10. Draw the plan of northerly bore-hole .....	<b>1</b>
11. Determine vertical section through the stratum .....	<b>4</b>
12. Drawing bore-hole of given length to determine required altitude (2, 1).	<b>3</b>
<b>(c) Angle between bore-holes at B (4)</b>	
13. Construction to determine required angle .....	<b>3</b>
14. Indicating the required angle .....	<b>1</b>
<b>TOTAL... 50</b>	

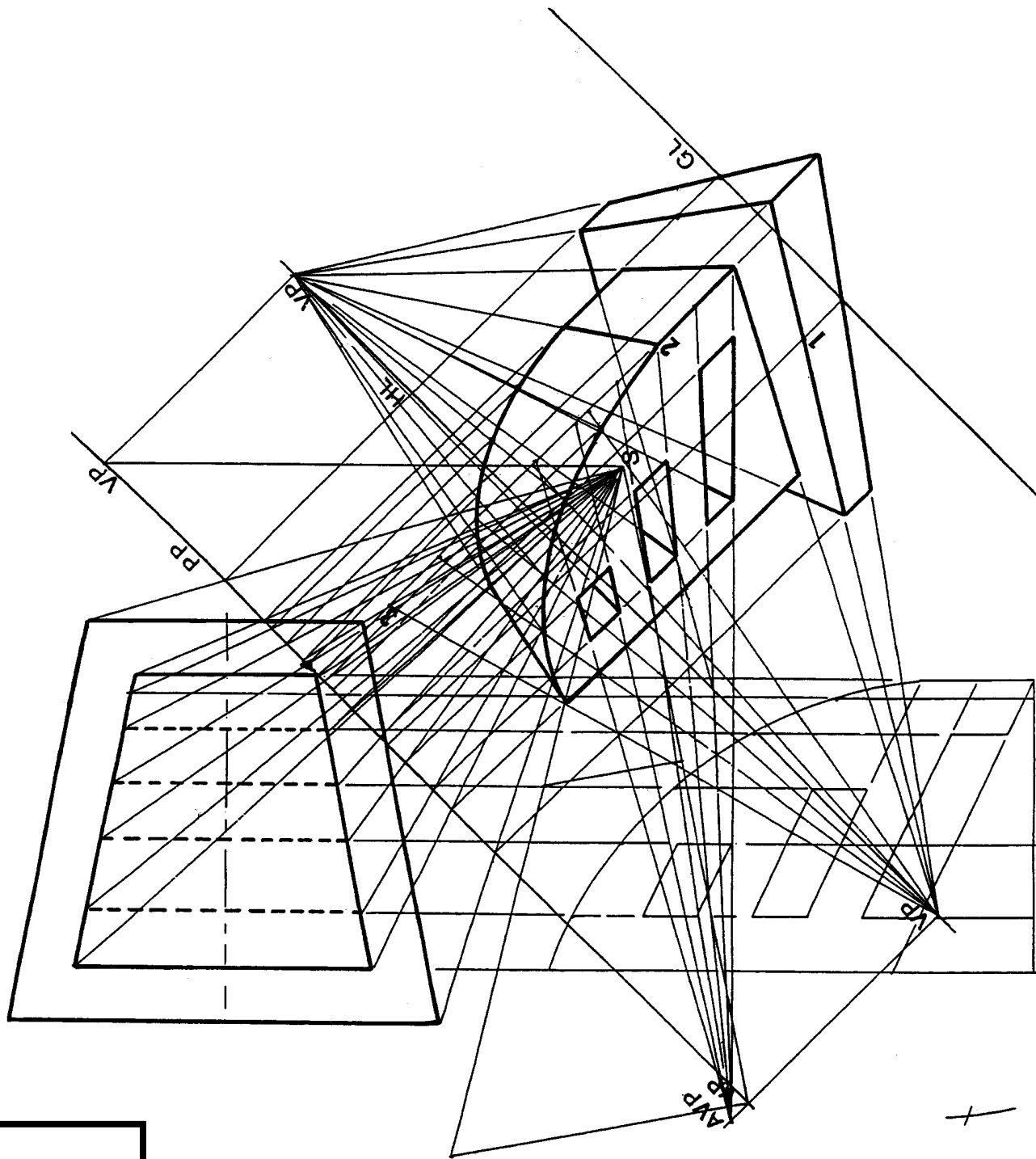
## QUESTION 6

<b>(a) Plan and Elevation (26)</b>	<b>MARKS</b>
1. Draw the given outline plan, set up outline elevation of ABCD (3, 3).....	<b>6</b>
2. Draw elements on ABCD in plan, project to elevation (3, 3).....	<b>6</b>
3. Extend elements on ABCD in plan to rectangular perimeter.....	<b>3</b>
4. Extend elements in elevation.....	<b>3</b>
5. Method for determining upper curve in elevation.....	<b>4</b>
6. Complete elevation.....	<b>4</b>
 <b>(b) End Elevation (12)</b>	
7. Set up outline of ABCD in end elevation.....	<b>2</b>
8. Draw elements on ABCD in end elevation .....	<b>2</b>
9. Proj. from plan and elevation to determine curves through B and D.....	<b>4</b>
10. Complete end elevation, presentation.....	<b>4</b>
 <b>(c) Traces of Plane Director (12)</b>	
11. Plane parallel to element in plan .....	<b>3</b>
12. Plane parallel to element in elevation .....	<b>3</b>
13. Determine correct location for traces .....	<b>2</b>
14. Determine horizontal trace .....	<b>2</b>
15. Determine vertical trace .....	<b>2</b>
<b>TOTAL... 50</b>	

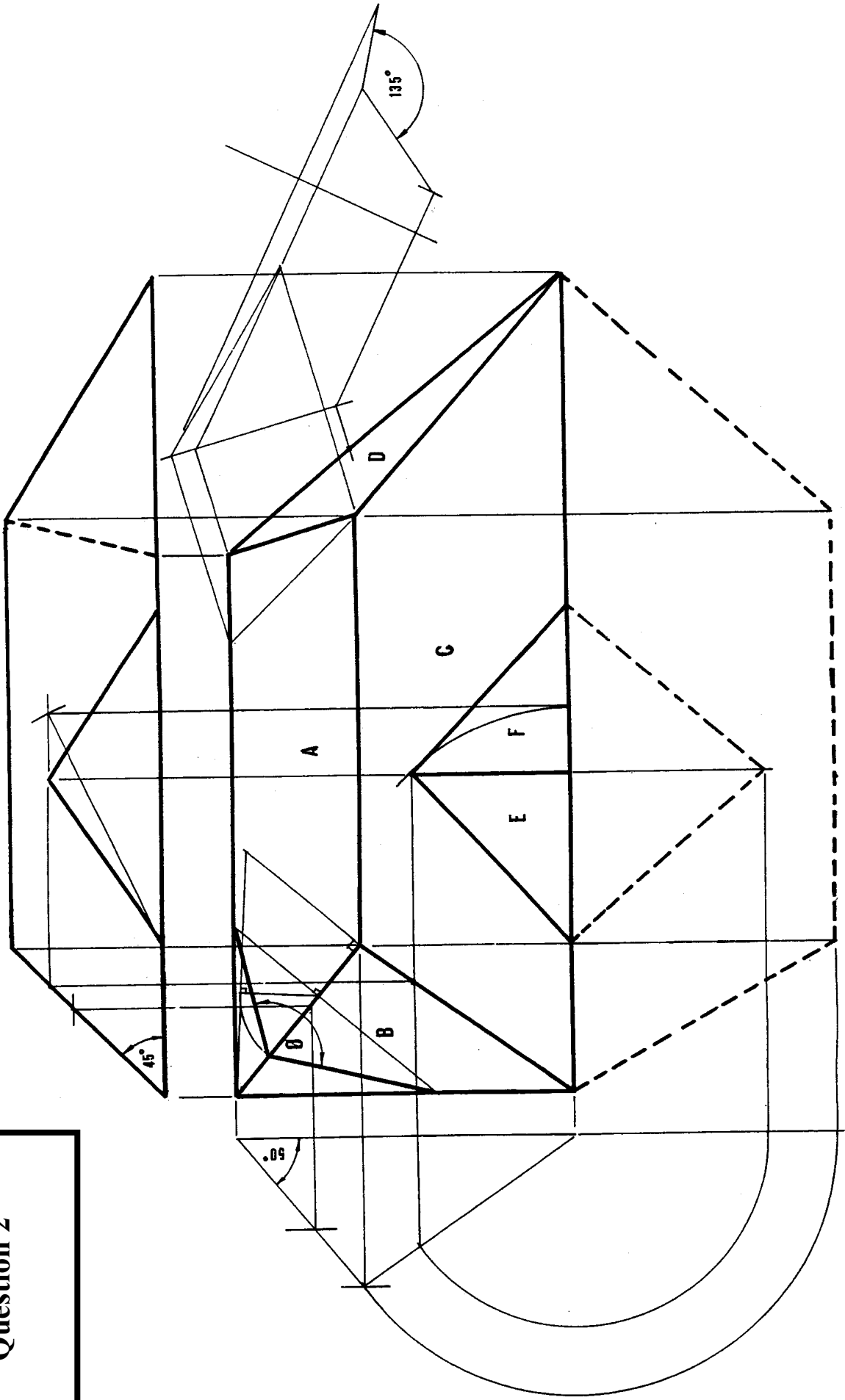
## QUESTION 7

<b>Earthworks between A and B – Level (9)</b>	<b>MARKS</b>
1. Parallel lines at 10 m intervals.....	3
2. Intersections with contours, drawing curves .....	6
<b>Earthworks between B and E – Embankments (7)</b>	
3. Determine arc rad. 20 m at 60 m level, draw tangents from 50 m level ...	3
4. Drawing parallel lines at 10 m intervals.....	2
5. Intersections with contours, drawing curves .....	2
<b>Earthworks between B and E – Cuttings (9)</b>	
6. Determine arc rad. 5 m at 55 m level, draw tangents from 60 m level.....	3
7. Determine parallel lines at 5 m intervals.....	2
8. Intersections with contours, drawing curves .....	4
<b>Parking Area (21)</b>	
9. <b>EDGE PAR.TO ROAD</b> -Arc at 55 m level, tang. from 60 m level.....	3
10. Parallel lines at 5 m intervals, int. with contours, draw curve .....	2
11. <b>EDGE ADJ. C</b> (Cutting) -5 m arc at 55 m level, tang. at 60 m level .....	2
12. Parallel lines at 5 m int., intersections with contours, drawing curve .....	2
13. <b>EDGE ADJ. C</b> (Embank.)-10 m arc at 60 m level, tang. at 55 m level ..	2
14. Parallel lines at 10 m int. intersections with contours, drawing curve .....	2
15. <b>EDGE ADJ. D</b> (Cutting)-5 m arc at 50 m level, tang. from 55 m level ..	2
16. Parallel lines at 5 m int., intersections with contours, drawing curve .....	2
17. <b>EDGE ADJ. D</b> (Embank.)-10 m arc at 55 m level, tang. at 50 m level...	2
18. Parallel lines at 10 m int., intersections with contours, drawing curve ....	2
<b>Completion and Presentation (4)</b>	
19. Determine intersections of cut and fill curves, presentation.....	4
<b>TOTAL... 50</b>	

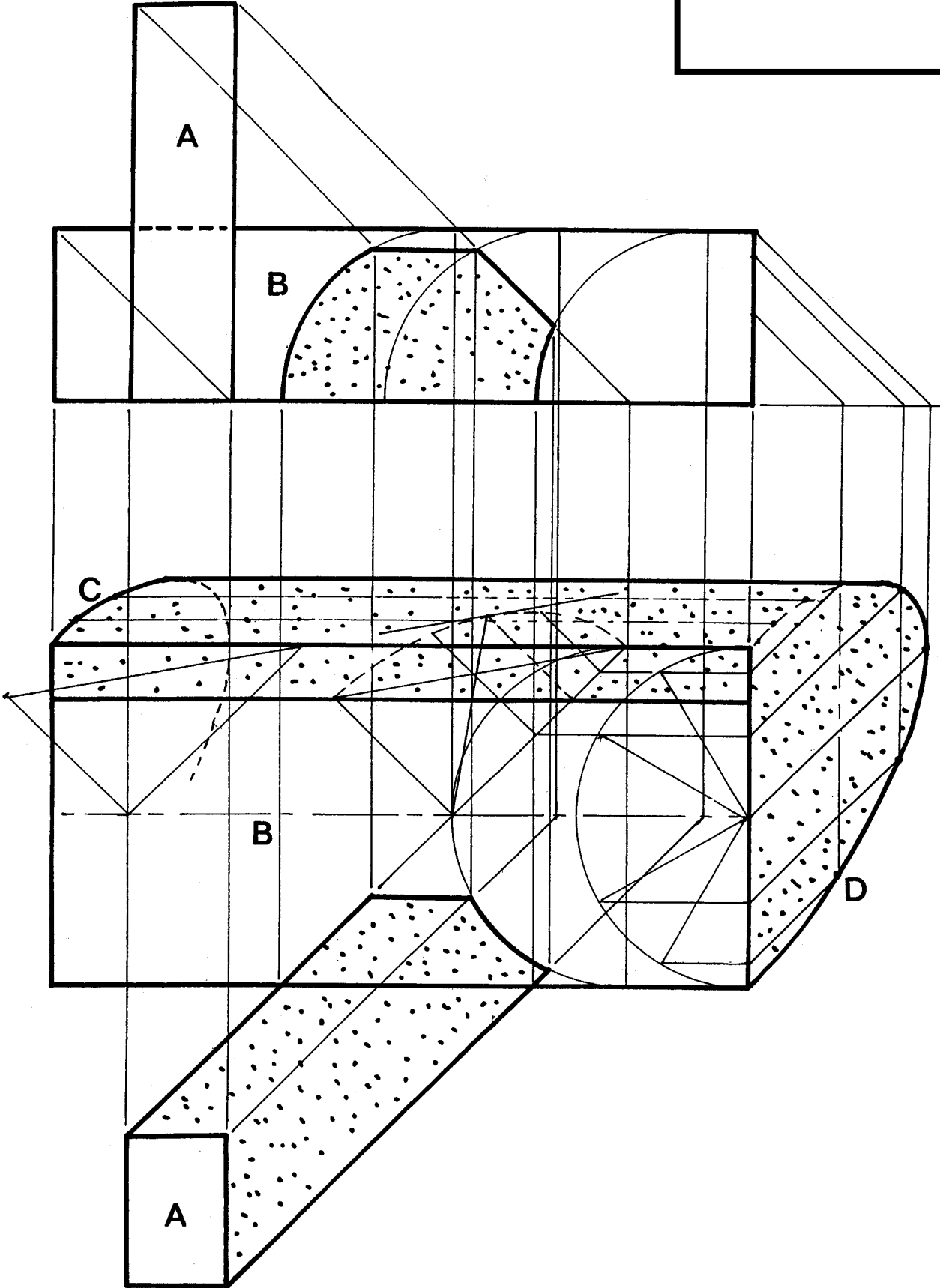
Question 1



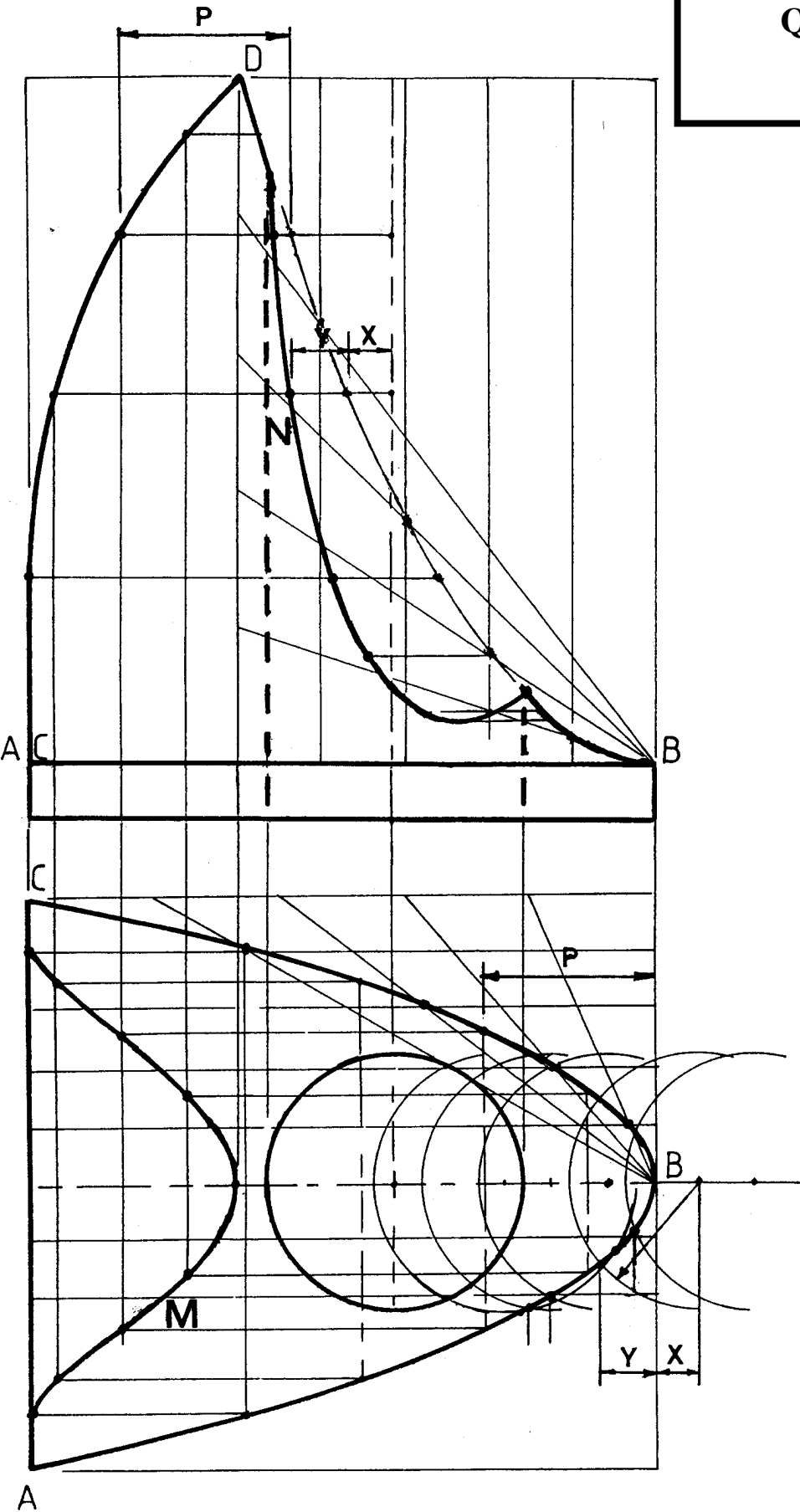
Question 2



Question 3

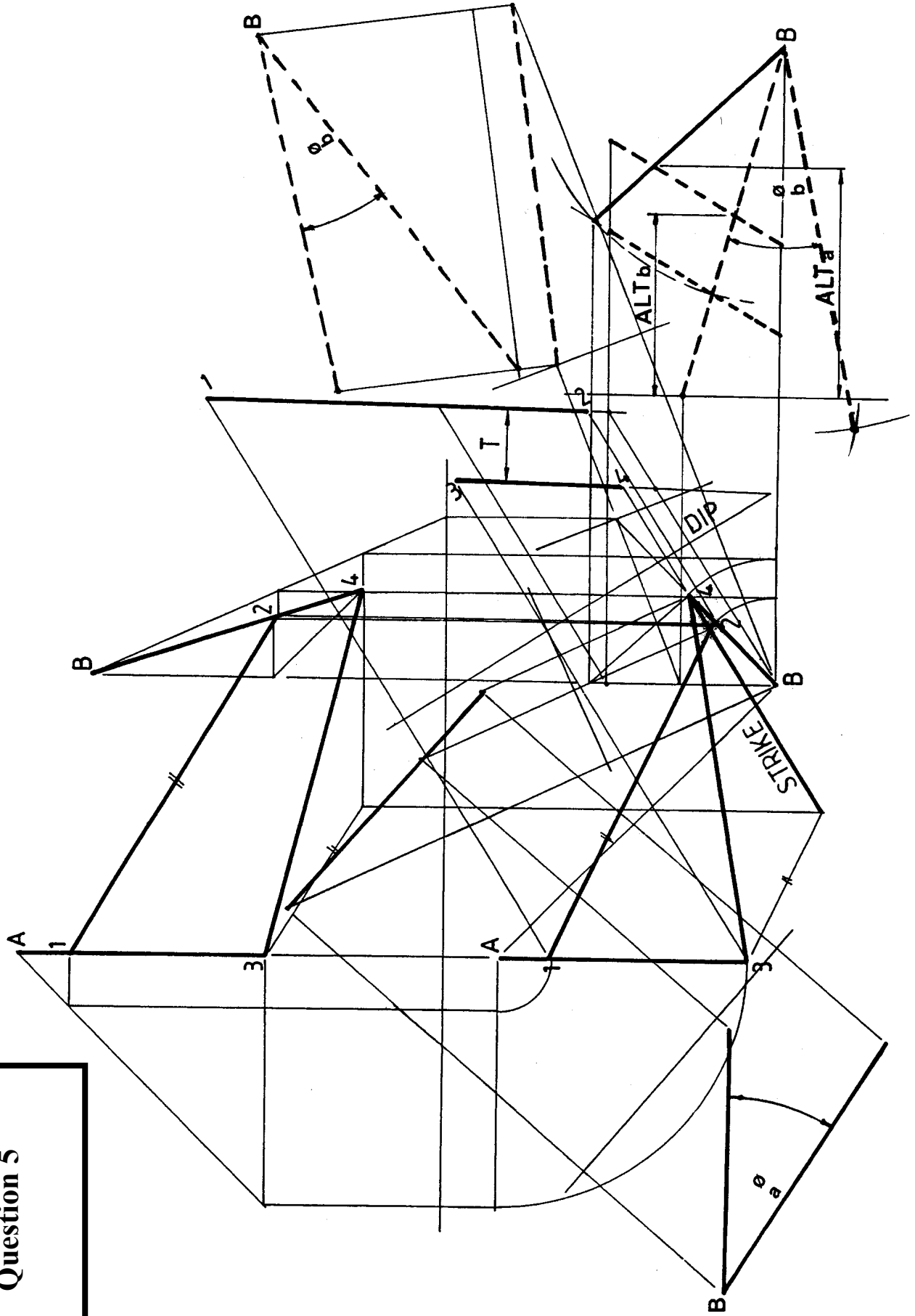


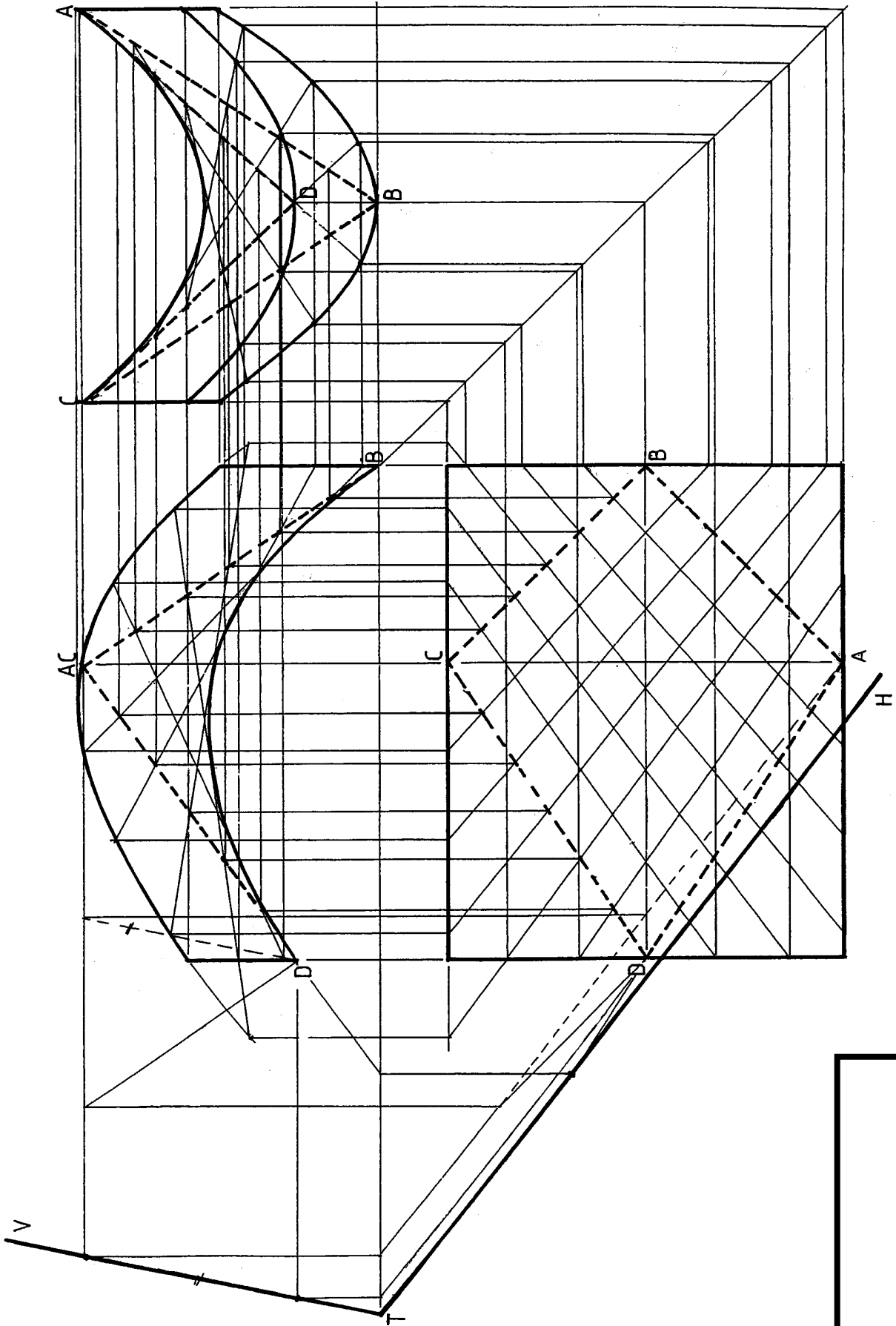
Question 4





Question 5





Question 6

