



# Coimisiún na Scrúduithe Stáit State Examinations Commission

Scéimeanna Marcála	Scrúduithe Ardteistiméireachta, 2007
<b>Líníocht Theicniúil</b>	<b>Ardleibhéal</b>

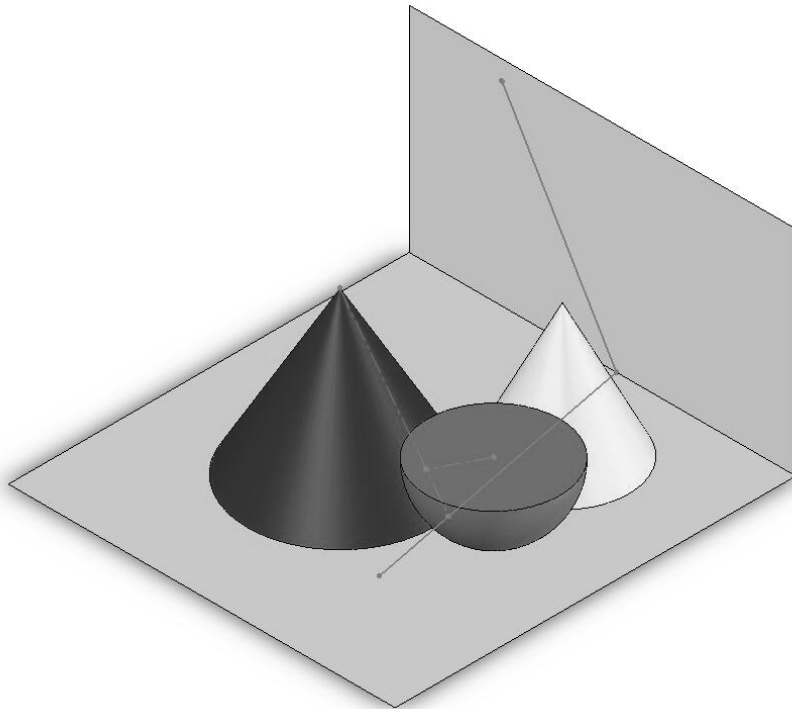
Marking Scheme	Leaving Certificate Examination, 2007
<b>Technical Drawing</b>	<b>Higher Level</b>



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

***Leaving Certificate Examination 2007***

***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 ..... 4
- (ii) Projection of planes and line of intersection on new  $X_1Y_1$  ..... 3
- (iii) New  $X_2Y_2$  taken perpendicular to line of intersection ..... 4
- (iv) Projection of ABC and ADE on  $X_2Y_2$  and indicating dihedral angle .. 4

**(c) Determining line from B**

- (i) Drawing 60mm cone of base angle  $45^\circ$  in an elevation ..... 3
- (ii) Drawing plan of cone ..... 3
- (iii) Drawing 60mm cone from B at  $40^\circ$  to ABC  
in a view showing ABC as an edge ..... 3
- (iv) Drawing correct required line in plan and elevation...(2,1) ..... 3

**(d) Skew lines**

- (i) Creating a plane containing BC (or AD)  
and parallel to AD (or BC) ..... 2
- (ii) Finding edge view of plane ..... 2
- (iii)  $X_2Y_2$  parallel to edge view of plane..... 2
- (iv) Location of shortest distance and projection to 1<sup>st</sup> aux..... 2
- (v) Projecting or measuring to plan and elevation ..... 2
- (vi) Determination and indication of length of shortest line ..... 3

**or**

- (i) Auxiliary view of AD and BC showing true length of one ..... 2
- (ii) Auxiliary view of AD and BC showing point view of one ..... 2
- (iii) Drawing perpendicular from point to other line..... 2
- (iv) Projecting back to 1<sup>st</sup> aux. and drawing line  
perpendicular to true length line...(1,1)..... 2
- (v) Projecting or measuring to plan and elevation ..... 2
- (vi) Determination and indication of length of shortest line ..... 3

**Total** **50**

**QUESTION 2**

**MARKS**

**(a) Drawing given figure**

- (i) Drawing line EDB..... 4
- (ii) Finding mean proportional EA between ED and EB ..... 7
- (iii) Location of point O and drawing of circle ..... 3
- (iv) Location of point C ..... 5
- (v) Completion of quadrilateral ABCD ..... 4

**(b) Division of Area**

- (i) Conversion of ABCD into triangle leaving point A and line CD intact...(Any = 1) ..... 3
- (ii) Division of base in the ratio 1:2 and drawing dividing line from A .... 3
- (iii) Conversion of ABCD into triangle leaving point A and line BC intact...(Any = 1) ..... 3
- (iv) Division of base in the ratio 1:2 and drawing dividing line from A .... 3

**(c) Square**

- (i) Redrawing of circle and secant BE..... 3
- (ii) Positioning of 1<sup>st</sup> vertex..... 2
- (iii) Locating 2<sup>nd</sup> vertex..... 1
- (iv) Locating 3<sup>rd</sup> vertex and drawing locus...(2,3)..... 5
- (v) Locating other vertices of required square and drawing same..... 4

**Total**

**50**

**QUESTION 3****MARKS****(a) Cone A and Hemisphere B**

- (i) Elevation and plan of cone A ..... 2
- (ii) Locate centre of hemisphere B and draw elevation of B ..... 3
- (iii) Bisection of angle between cone edge and XY line  
or draw line 40mm 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 hemisphere (incl. hid. det) ..... 4

**(b) Projections of 2<sup>nd</sup> Cone C**

- (i) Elevation of point P ..... 1
- (ii) Locate plan of point P and draw line OP extended ..... 2
- (iii) Elevation of point 20mm above H.P. at edge of hemisphere ..... 1
- (iv) Drawing of normal and tangent at this point ..... 4
- (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) ..... 3

**(c) Tangent Plane**

- (i) Draw horizontal trace ..... 3
- (ii) Construct and draw correct vertical trace ..... 3
- (iii) Project height of point of contact from an elevation ..... 2
- (iv) Locate plan of point of contact ..... 2
- (v) Locate elevation of point of contact ..... 2

**Total****50**

**QUESTION 4**

**MARKS**

**Outline Plan and Elevation**

(i)	Drawing outline plan of triangular prism.....	3
(ii)	Determination of height and drawing of outline elevation.....	4
(iii)	Drawing of cut surfaces in plan.....	3
(iv)	Drawing outline elevation of inclined prism...(3,1) .....	4
(v)	Transfer of widths to plan .....	3

**Interpenetration**

(vi)	Determining points <b>A, B, C, D &amp; E</b> in elevation and plan.....	5
(vii)	Determining points <b>F &amp; G</b> in elevation and plan...(2,2) .....	4
(viii)	Determining points <b>H, I, J, &amp; K</b> in elevation and plan...(4x1) .....	4
(ix)	Determining points <b>L &amp; M</b> in plan.....	2
(x)	Determining points <b>N &amp; O</b> in elevation and plan .....	4
(xi)	Determining points <b>P &amp; Q</b> in plan.....	2
(xii)	Determining points <b>R &amp; S</b> in plan.....	4
(xiii)	Joining intersection points in correct order.....	3
(xiv)	Completion of drawing (incl. hidden detail) .....	5

<b>Total</b>	<b>50</b>
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**QUESTION 5****MARKS**

<b>(a)</b>	(i)	Drawing figure as given .....	4
	(ii)	Dividing arc ACM into a number of equal parts (9 min) .....	2
	(iii)	Drawing line MP in rotated positions .....	3
	(iv)	Stepping distances to locate B <sub>1</sub> , B <sub>2</sub> , B <sub>3</sub> etc.....	2
	(v)	Location of O <sub>1</sub> , O <sub>2</sub> , O <sub>3</sub> etc .....	3
	(vi)	Drawing arcs OP <sub>1</sub> , OP <sub>2</sub> , OP <sub>3</sub> from O <sub>1</sub> , O <sub>2</sub> and O <sub>3</sub> , respectively.....	8
	(vii)	Drawing arcs C <sub>1</sub> -P <sub>1</sub> , C <sub>2</sub> -P <sub>2</sub> , C <sub>3</sub> -P <sub>3</sub> from B <sub>1</sub> , B <sub>2</sub> , B <sub>3</sub> , respectively.....	9
	(viii)	Plotting of correct curve .....	5
<b>(b)</b>	<b>Involute</b>		
	(i)	Redrawing of circle and line MP .....	1
	(ii)	Drawing dividing lines at 30° intervals .....	1
	(iii)	Drawing of tangents at ends of dividing lines.....	4
	(iv)	Completion of involute locating S, P <sub>1</sub> , P <sub>2</sub> , etc.....	7
	(v)	Plotting of correct curve .....	1

**Total****50**



**QUESTION 6****MARKS**

- (a) (i) Drawing triangle PFA ..... 3  
(ii) Locating point on directrix and drawing directrix..... 4  
(iii) Determining major axis ..... 2  
(iv) Locating points on the curve (min 5 excl. vertices) ..... 5  
(v) Drawing curve...(Any = 2) ..... 4

**Tangent**

- (vi) Drawing line FX from focus parallel to AP ..... 1  
(vii) Determining point of contact..... 3  
(viii) Drawing of required tangent...(Any = 1) ..... 2

*or*

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

- (b) (i) Drawing lines AF and AB ..... 3  
(ii) Determining point of contact P..... 5  
(iii) Locating points on the curve...(min 5 + vertex) ..... 7  
(iv) Drawing curve...(Any = 2) ..... 3

**Circle**

- (v) Drawing of normal at point P..... 2  
(vi) Bisection of angle between AF and AB..... 3  
(vii) Locate centre and draw required circle ..... 3

**Total****50**

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

- (i) Drawing elevation of pyramid resting on H.P..... 2
- (ii) Rotated pyramid in elevation..... 3
- (iii) Required plan of pyramid..... 5
- (iv) Drawing elevation of pyramid ..... 5
- (v) Drawing of VTH and  $V_1T_1H_1$  ..... 5

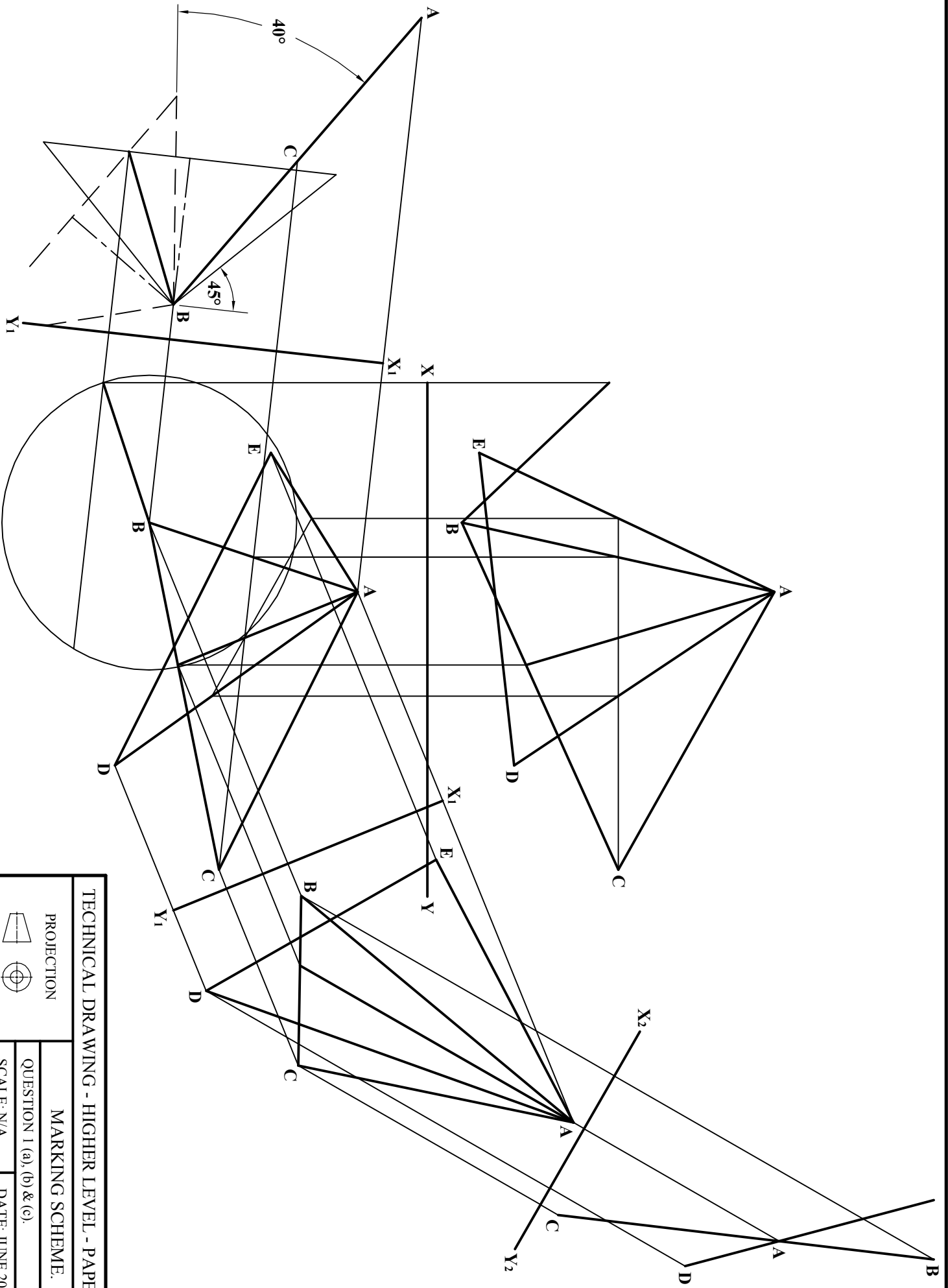
**(b) Cut Pyramid**

- (i) Auxiliary direction and  $X_1Y_1$  ..... 2
- (ii) Edge view of plane..... 3
- (iii) Identification of cut surface in auxiliary view ..... 3
- (iv) Cut surface in plan and elevation..... 10
- (v) Completion of plan and elevation..... 5

**(c) Equilateral Triangle**

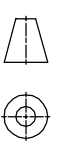
- (i) Determine altitude of equilateral triangle ..... 1
- (ii) Determine side length of equilateral triangle..... 1
- (iii) Drawing plan and elevation of triangle..... 2
- (iv) Locate plan and elevation of circumcentre ..... 3

**Total****50**



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

PROJECTION

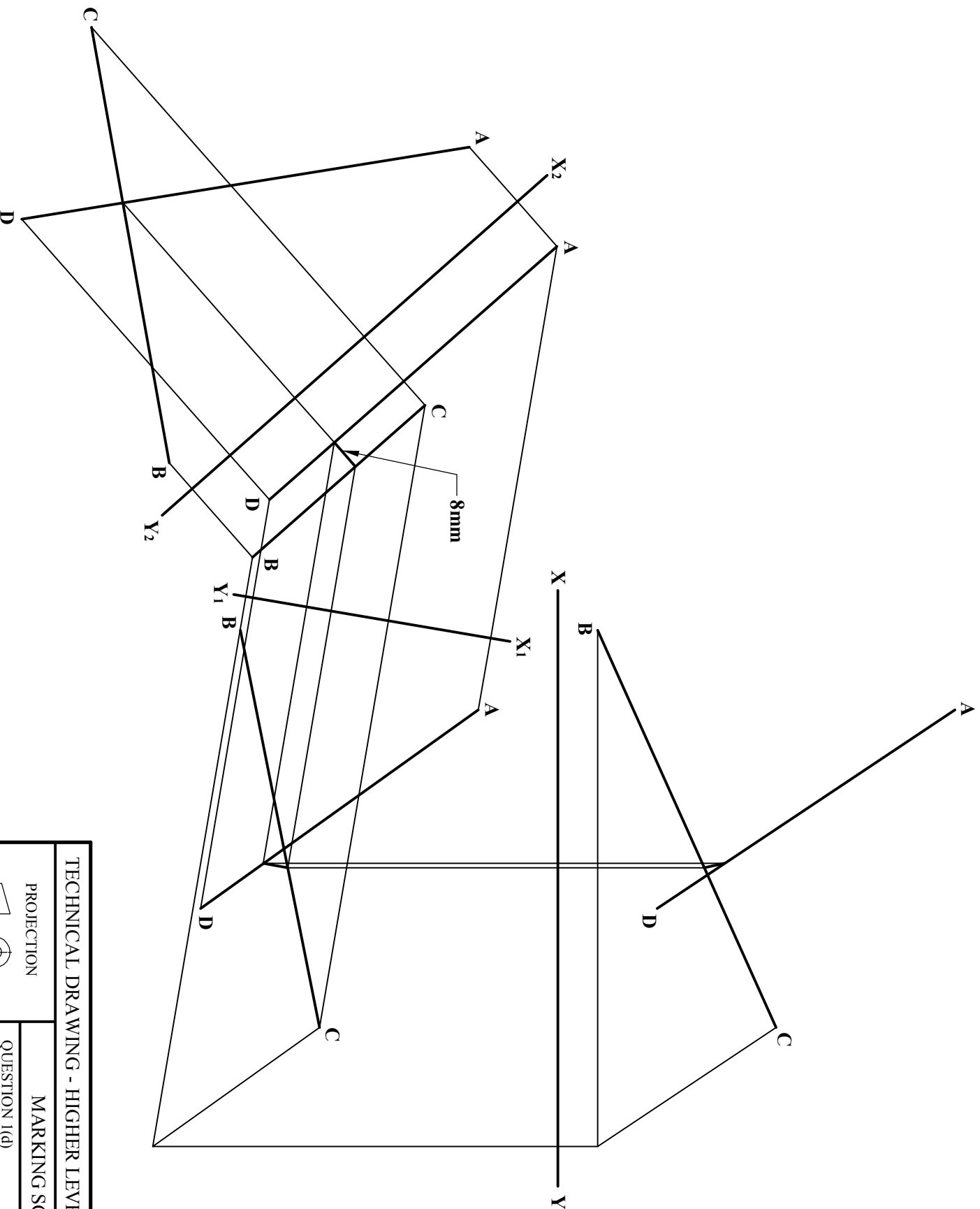


MARKING SCHEME.

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

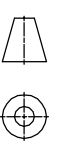
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DATE: JUNE 2007.



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

PROJECTION

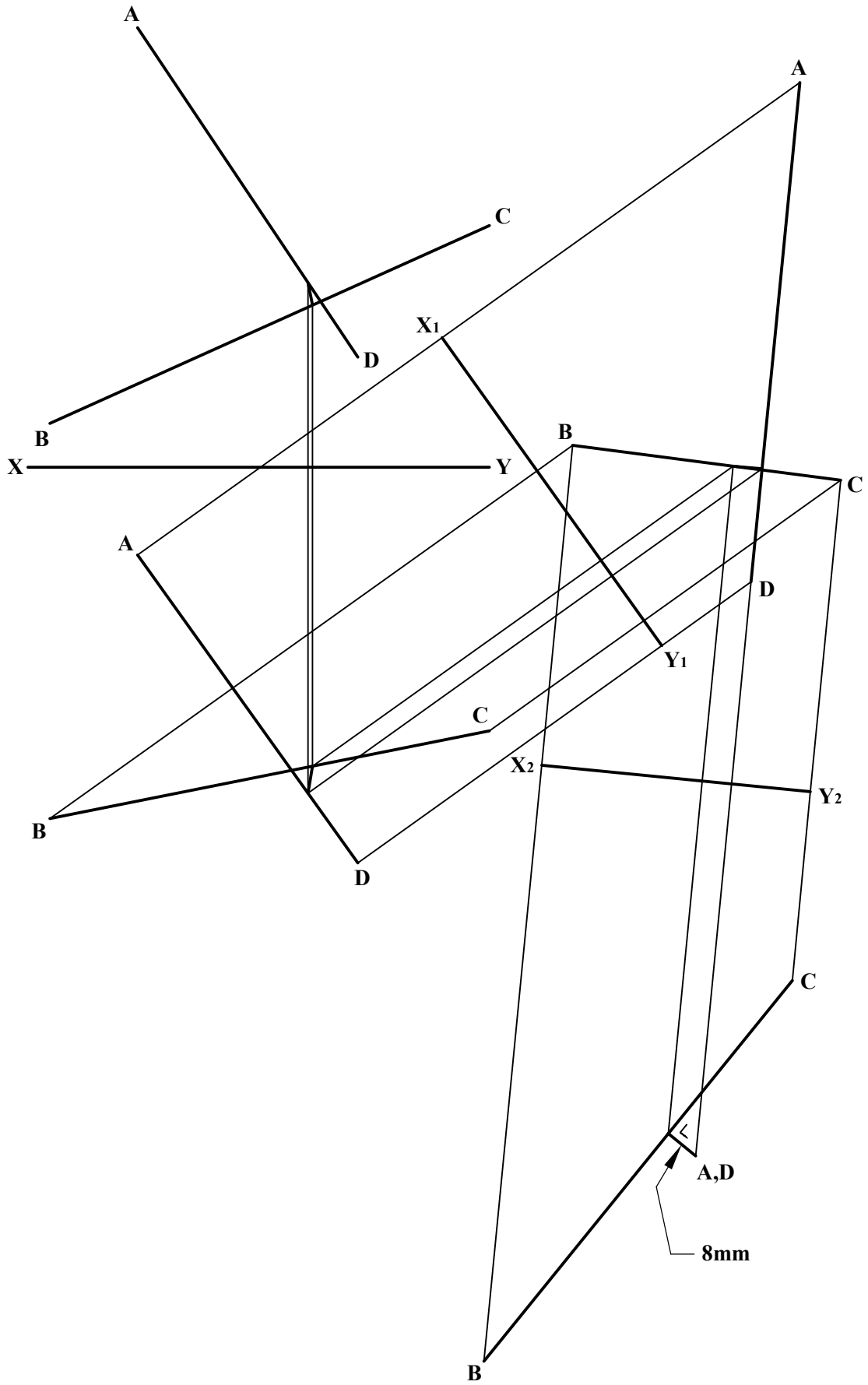


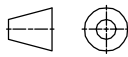
MARKING SCHEME.

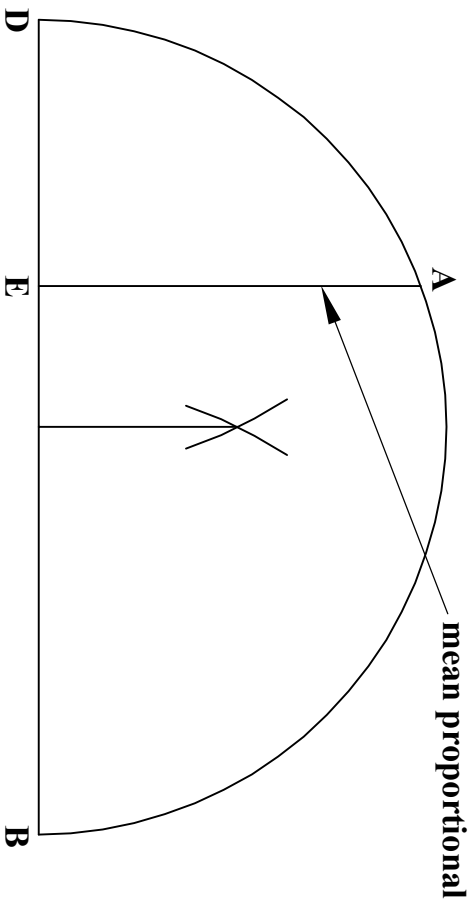
QUESTION 1(d)

SCALE: N/A.

DATE: JUNE 2007.

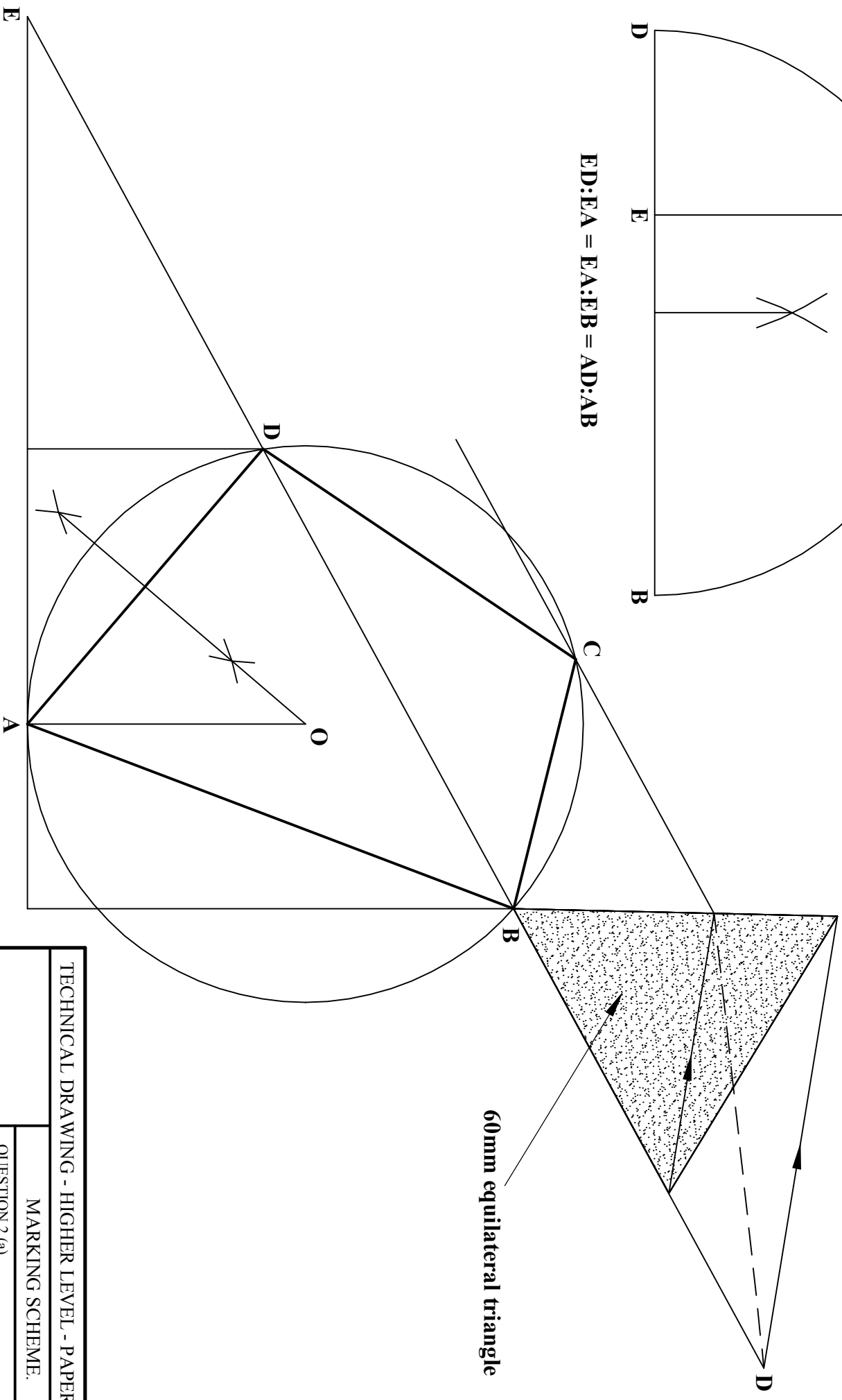


TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.		
PROJECTION	MARKING SCHEME.	
	QUESTION 1(d).	
	SCALE: N/A	DATE: JUNE 2007.



$$ED:EA = EA:EB = AD:AB$$

mean proportional



60mm equilateral triangle

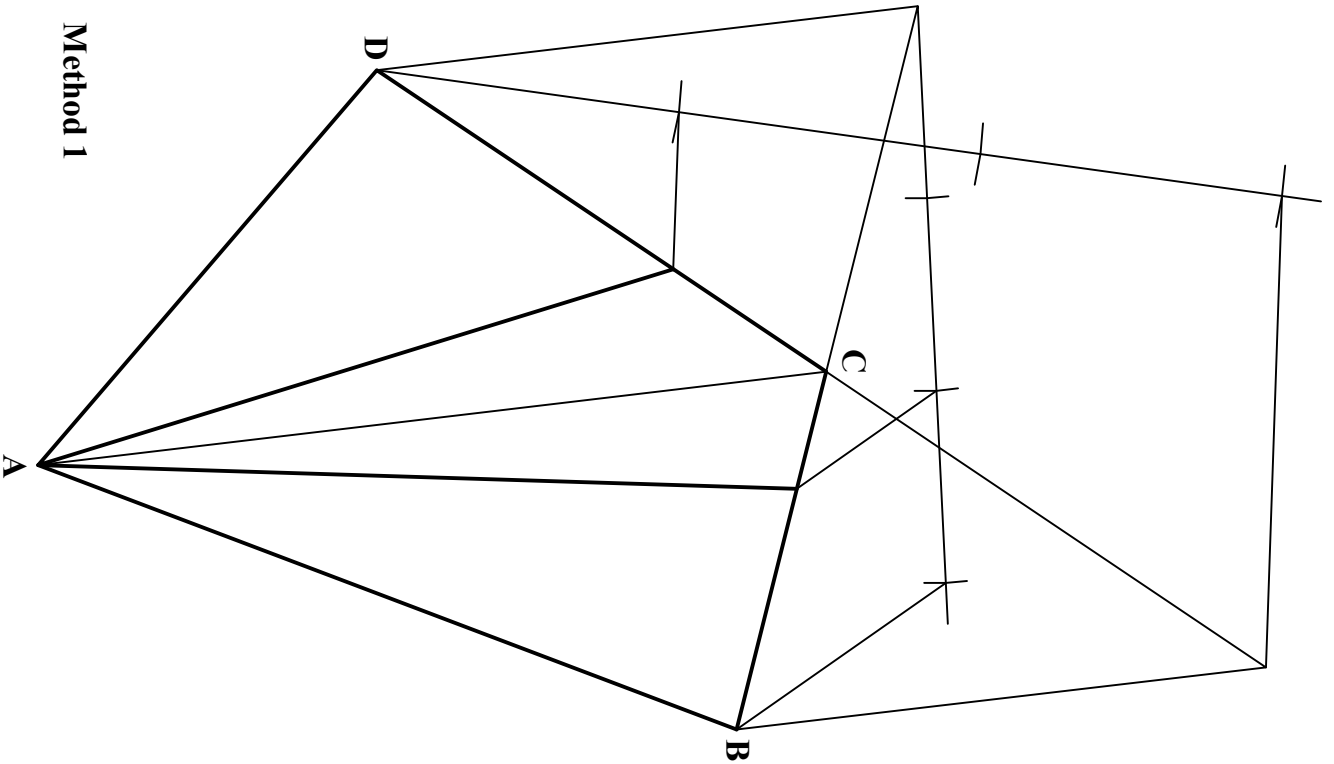
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

MARKING SCHEME.

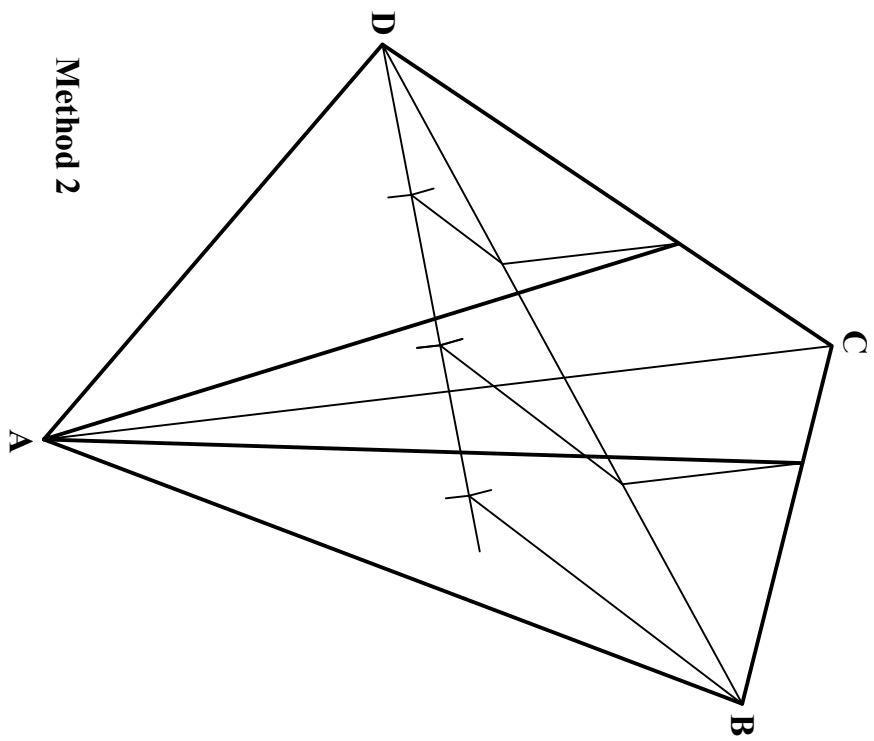
QUESTION 2 (a).

SCALE: 1:1.

DATE: JUNE 2007.



**Method 1**



**Method 2**

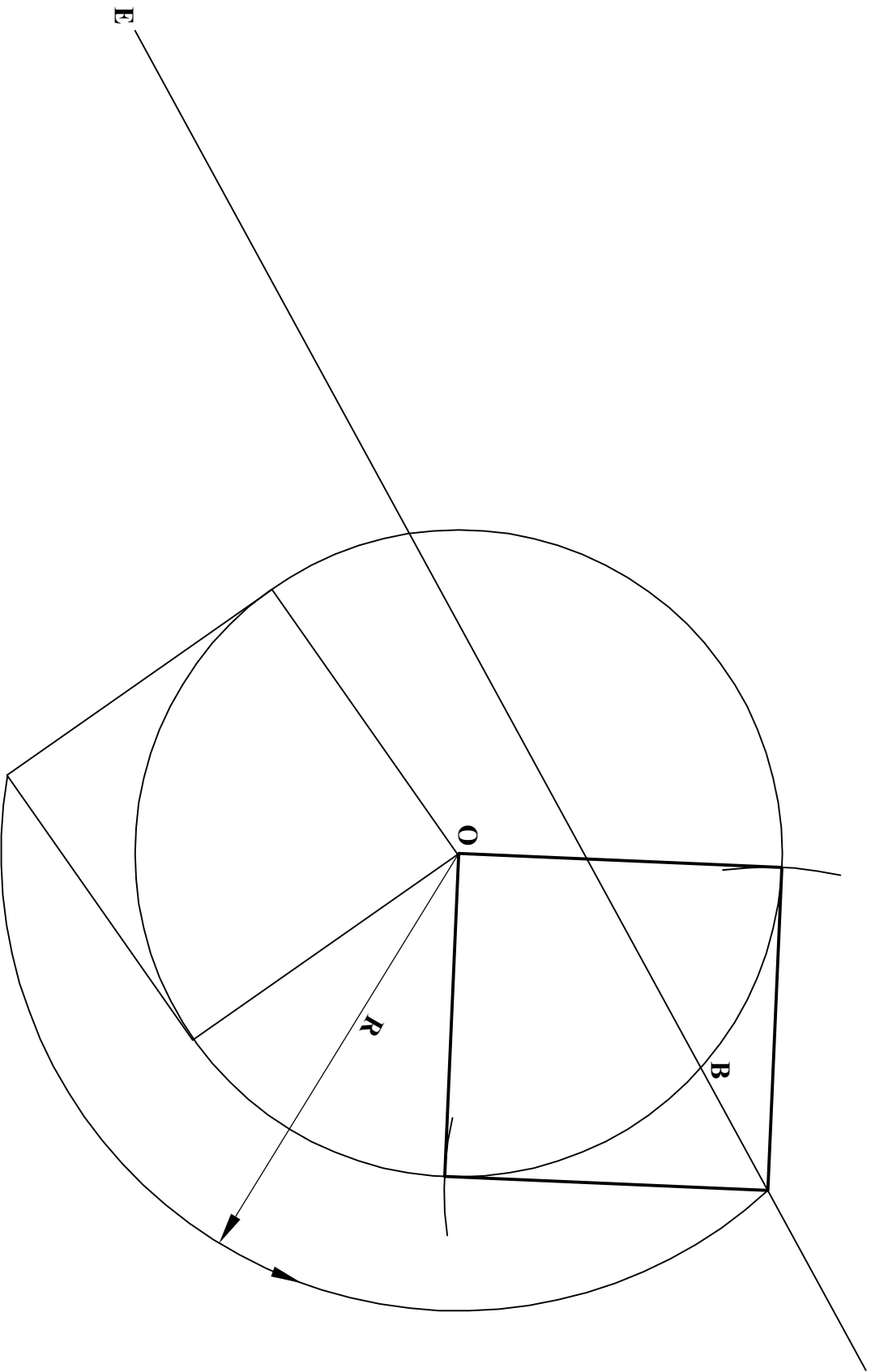
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

MARKING SCHEME.

QUESTION 2 (b).

SCALE: 1:1.

DATE: JUNE 2007.



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

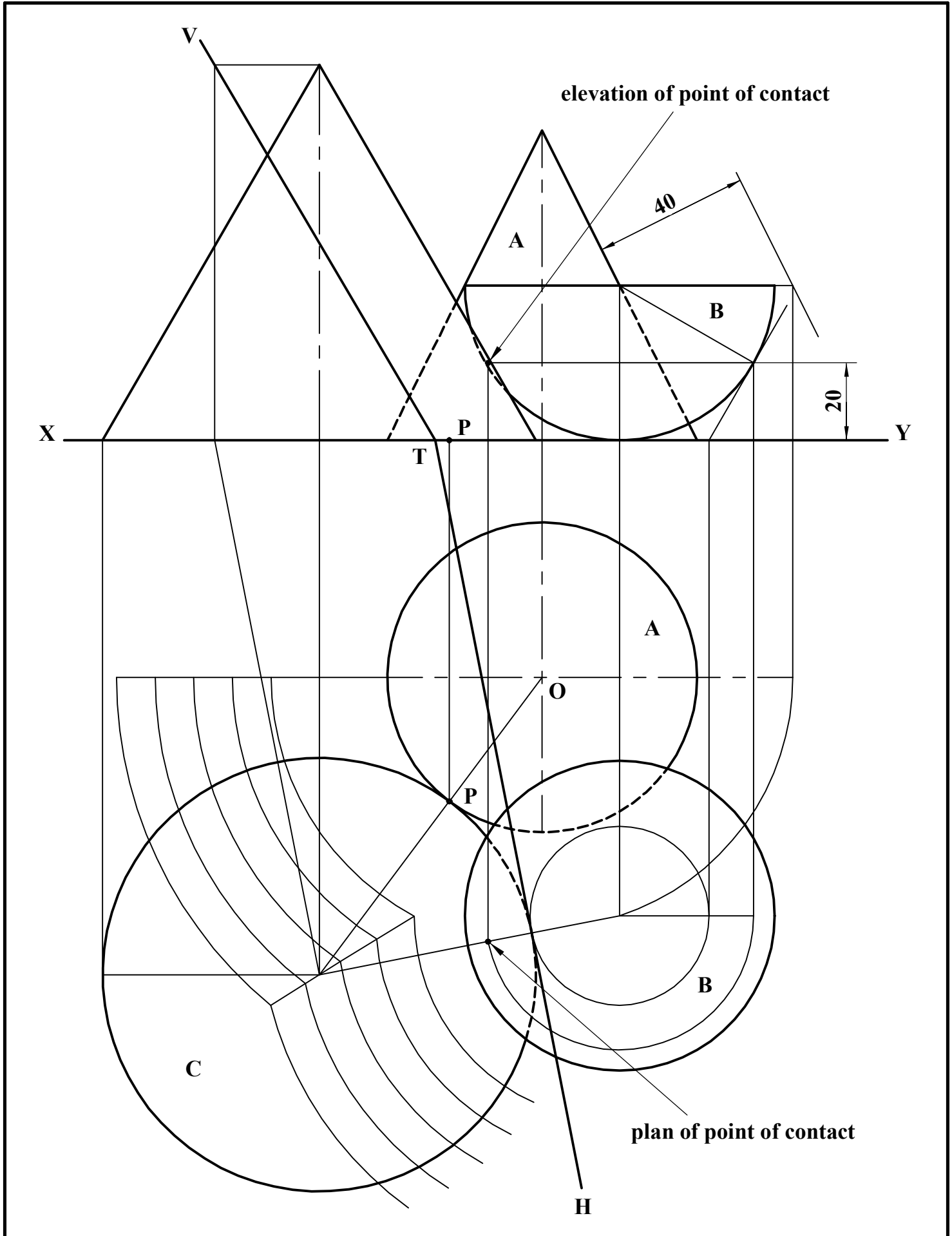
MARKING SCHEME.

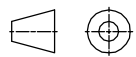
QUESTION 2 (c).

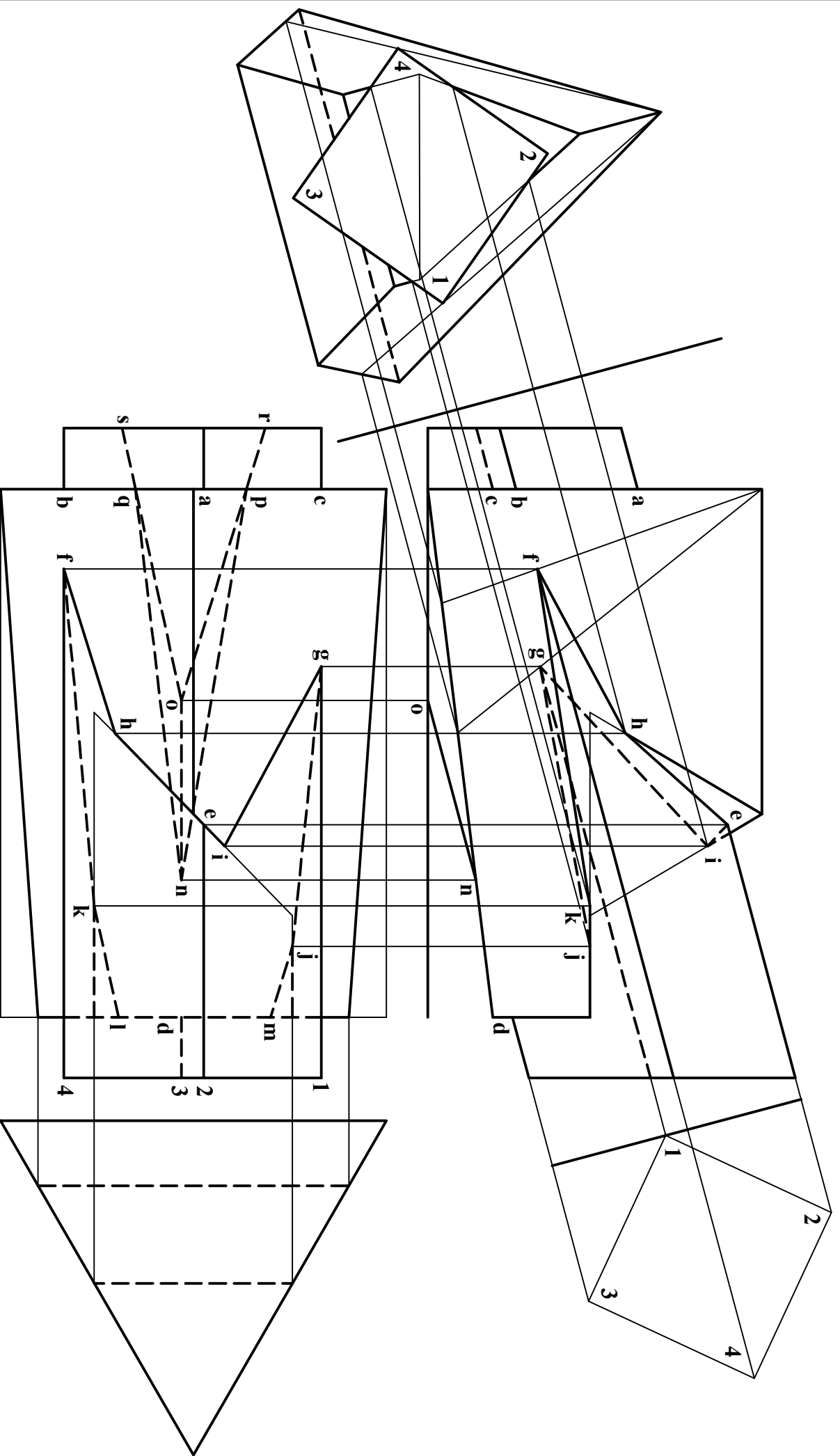
SCALE: 1:1.

DATE: JUNE 2007.





TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.	
PROJECTION	MARKING SCHEME.
	QUESTION 3.
SCALE: N/A.	DATE: JUNE 2007.



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

PROJECTION

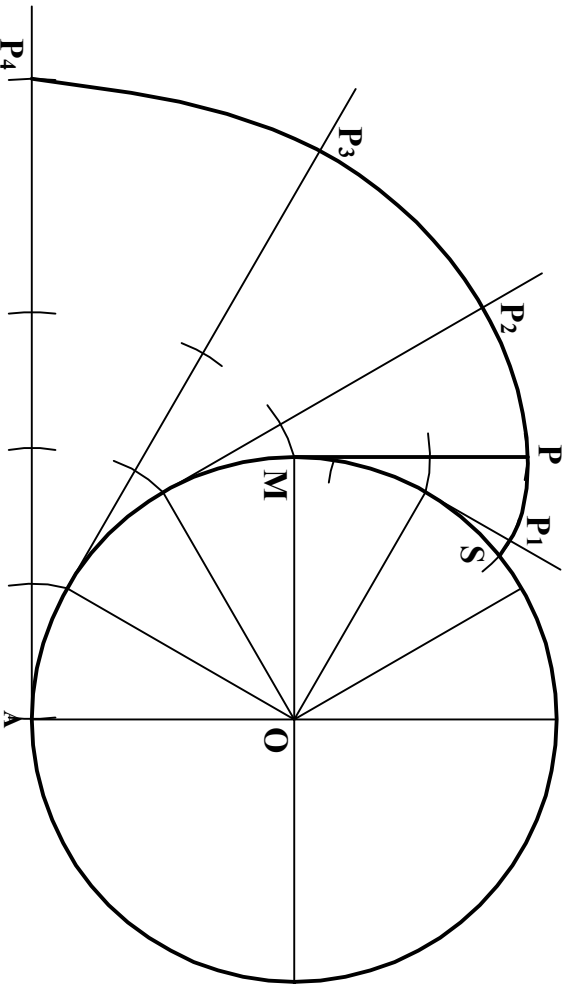
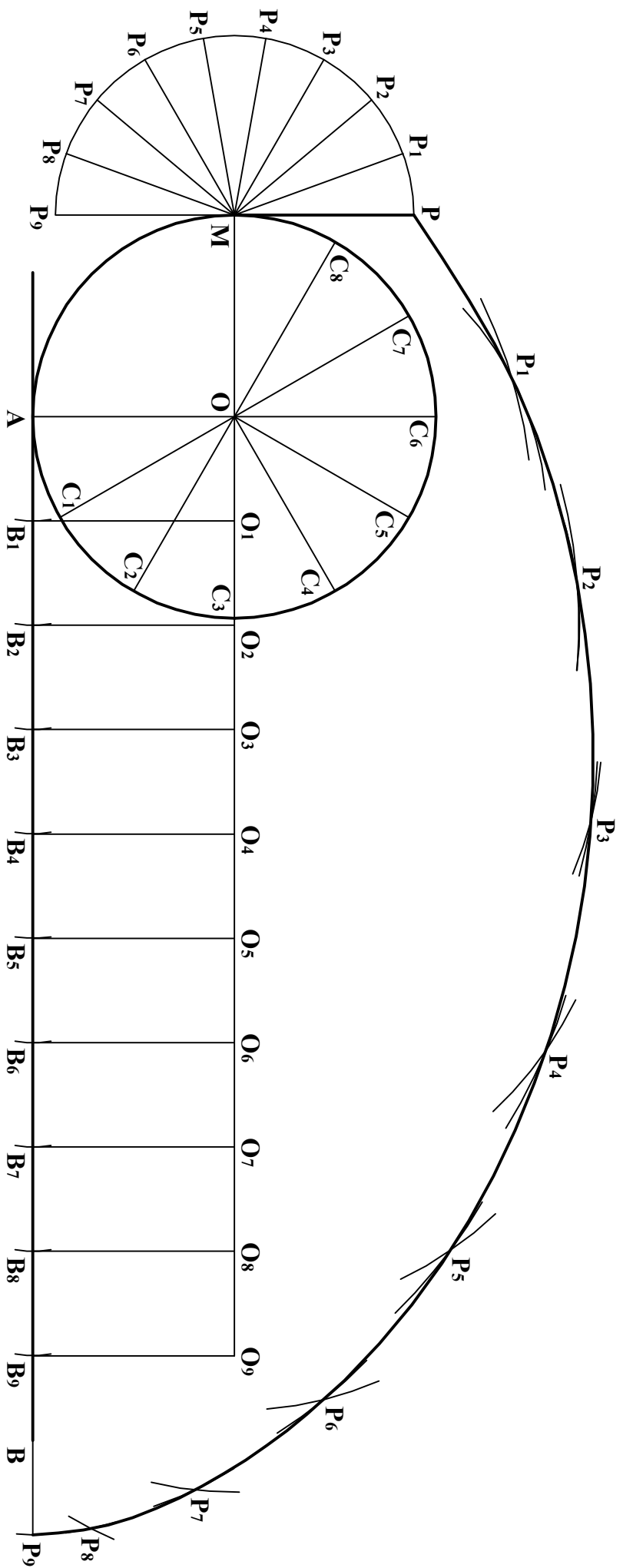


MARKING SCHEME.

QUESTION 4.

SCALE: N/A.

DATE: JUNE 2007.



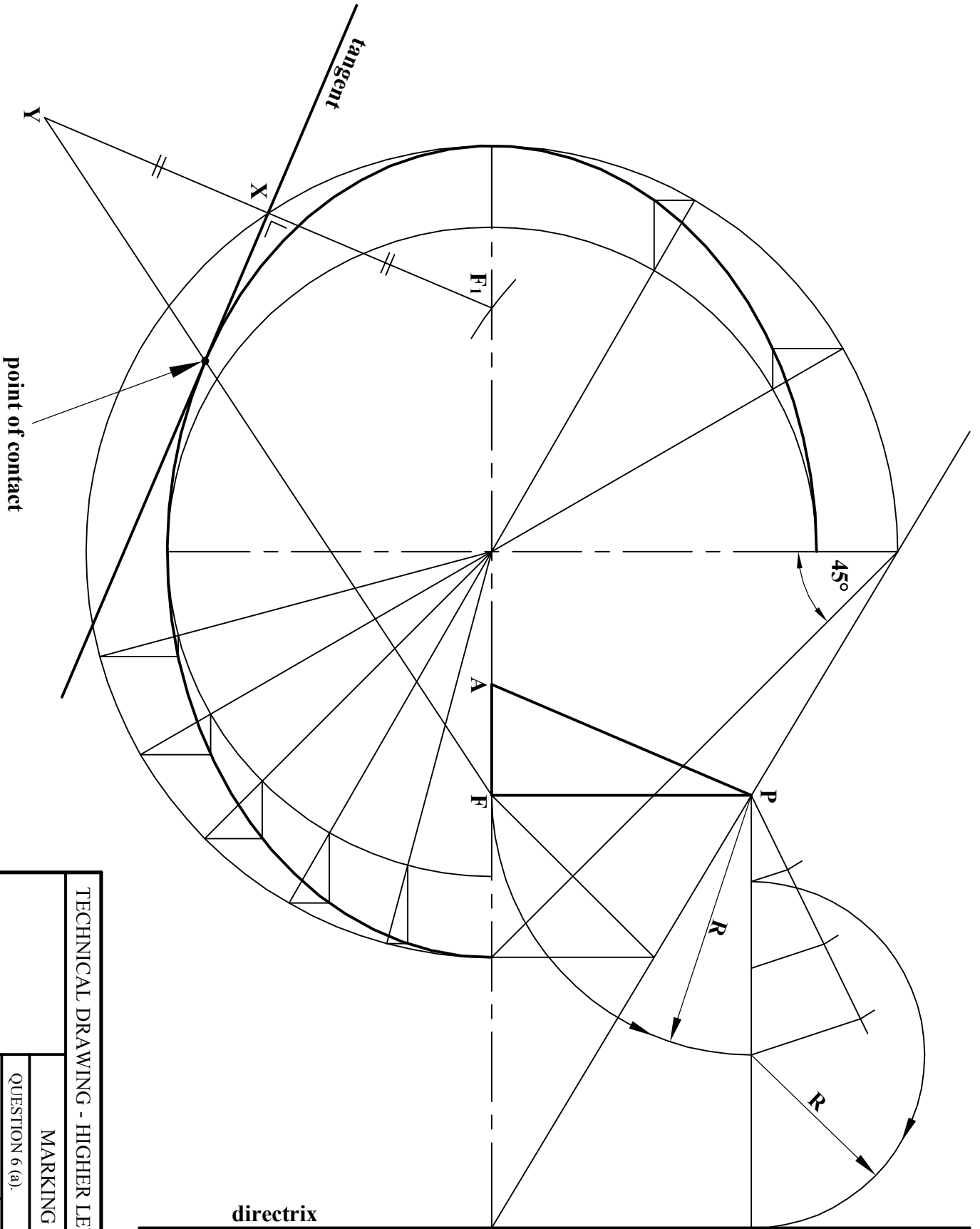
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

MARKING SCHEME.

QUESTION 5.

SCALE: N/A

DATE: JUNE 2007.



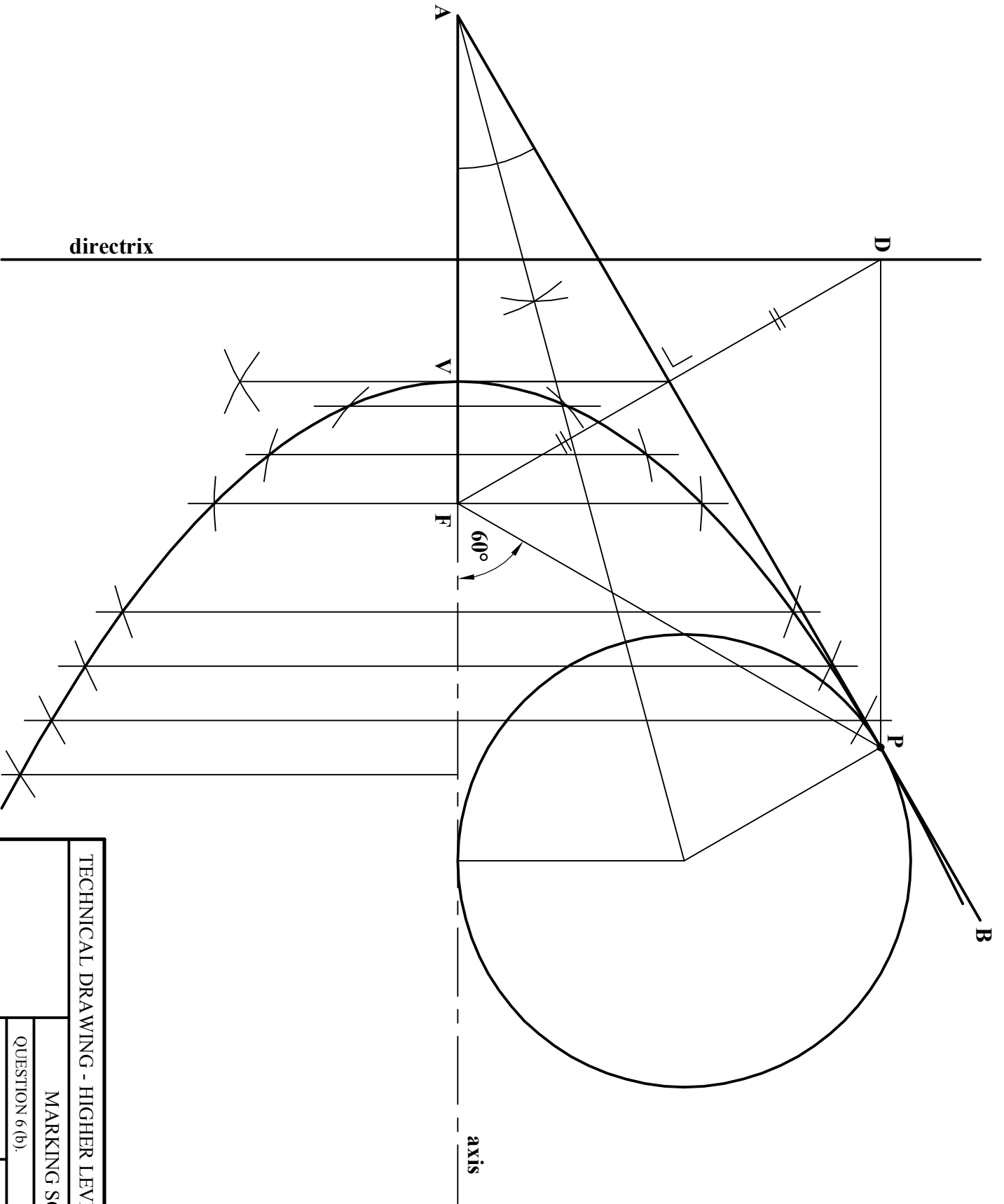
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

MARKING SCHEME.

QUESTION 6 (a).

SCALE: 1:1.

DATE: JUNE 2007.



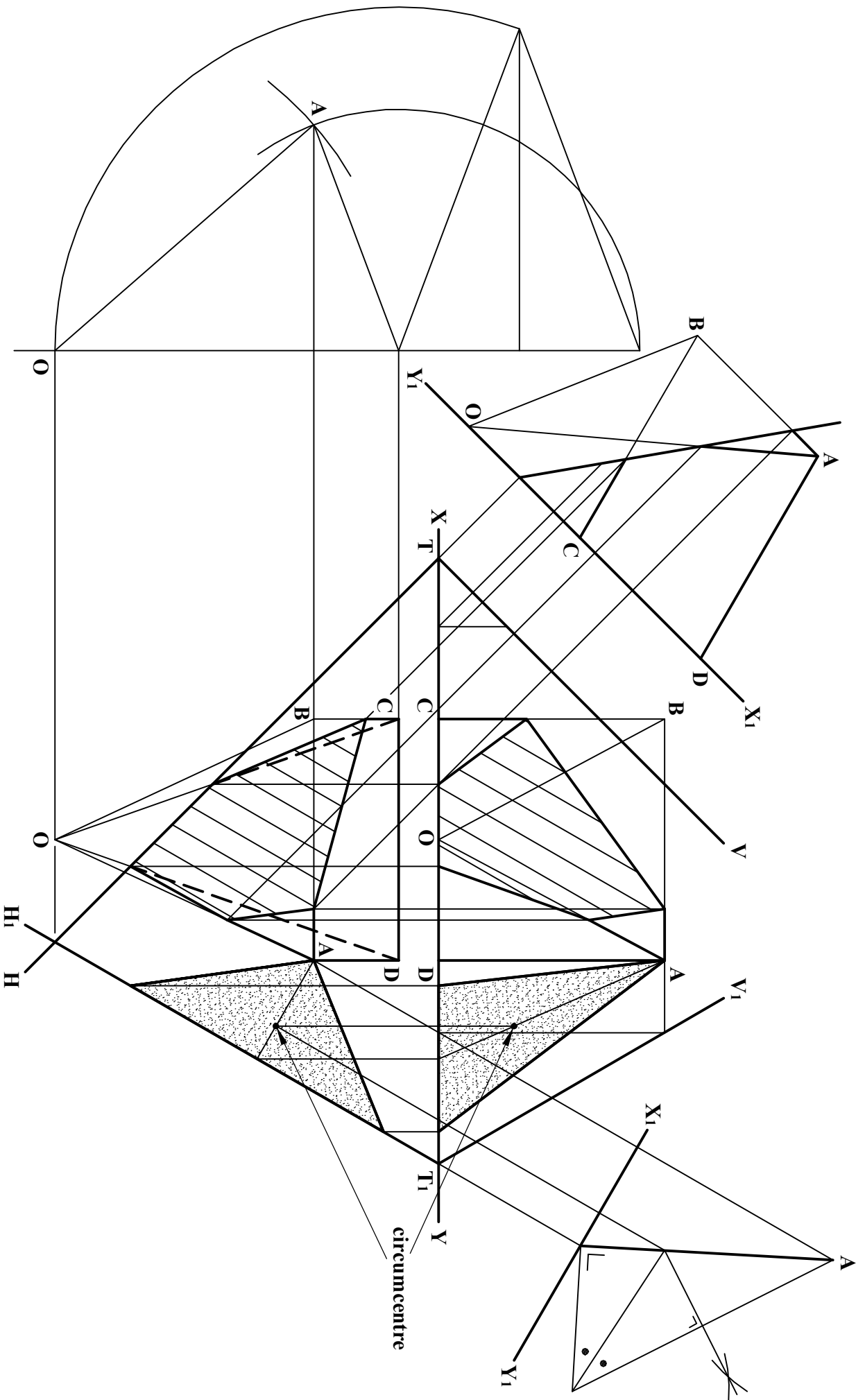
TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

MARKING SCHEME.

QUESTION 6 (b).

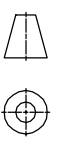
SCALE: 1:1.

DATE: JUNE 2007.



TECHNICAL DRAWING - HIGHER LEVEL - PAPER 1.

PROJECTION



MARKING SCHEME.

QUESTION 7.

SCALE: N/A.

DATE: JUNE 2007.

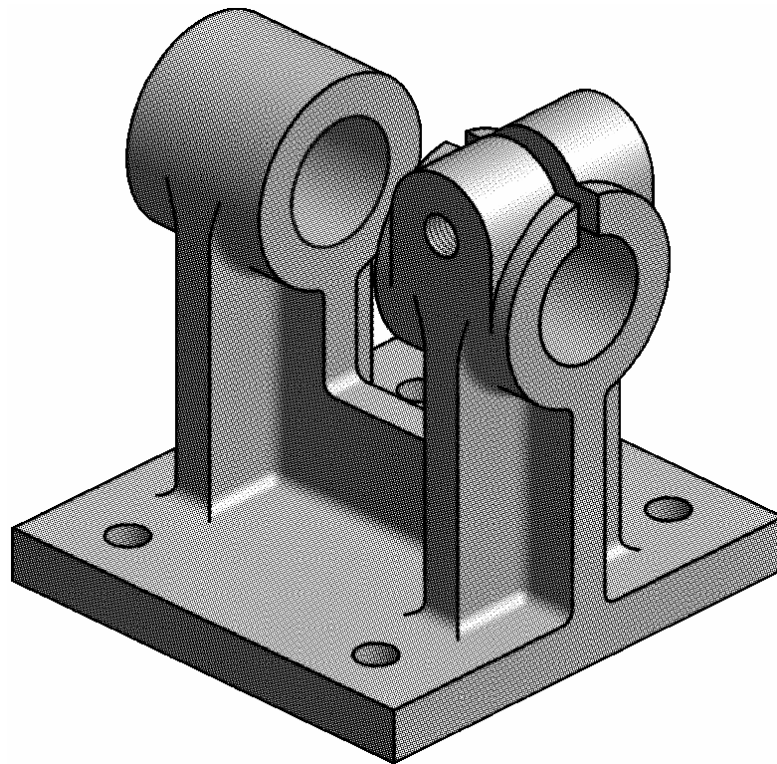


**Coimisiún na Scrúduithe Stáit**  
***State Examinations Commission***

Leaving Certificate Examination 2007

# 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	6
(b)	SECTIONAL ELEVATION	25
(c)	ADDITIONAL REQUIREMENTS	13
(d)	OPERATION/MODIFICATION	<u>6</u>
	TOTAL	50 Marks

<b>ASSEMBLY</b>	<b>(6)</b>	<b>PULLEY</b>	<b>5</b>
Shaft in body	1	Pulley rim	1
M10 screw in position	1	Lip on rim	1
Left bush in pulley	1	Web	1
Right bush in pulley	1	Boss	1
Pulley on shaft	1	Fillets	1
Nut & Washer on shaft	1		
		<b>WASHER</b>	<b>1</b>
		Washer outline	1
<b>SECTIONAL ELEVATION</b>	<b>(25)</b>	<b>M24 NUT</b>	<b>2</b>
<b>BODY</b>	<b>7</b>	Three faces on nut	1
Base	1	Curves on faces	1
Left support	1		
Left boss	1	<b>ADDITIONAL REQUIREMENTS (13)</b>	
Central web	1	Centre lines	1
Right support	1	Hatching of components	3
Right clamp	1	Parts item referenced	3
Fillets	1	(Leaders Terminations Numbers)	
<b>SHAFT</b>	<b>6</b>	Title supplied	2
30mm x 115mm	1	(G=1 Ex=2)	
Flat/ groove	1	Overall presentation	4
70x15mm	1	(F=2 G=3 Ex=4)	
40mm x 60mm	1		
M24 thread convention & chamfer	1	<b>MODIFICATION</b>	<b>(6)</b>
Eccentricity correct	1	Suitable modification suggested	2
<b>M10 SCREW</b>	<b>1</b>	Method shown in sketch	2
Screw diameter	1	Sketch presentation	2
<b>LEFT BUSH</b>	<b>2</b>		
Bush head	1		
Bush body	1		
<b>RIGHT BUSH</b>	<b>1</b>		
Bush head/body	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>14</b>	<b>LAYOUT</b>	<b>4</b>
Suitable divisions 0 <sup>0</sup> to 360 <sup>0</sup>	1	Centre lines	1
Correct height	1	Crank OA	1
S.H.M construction	3	Link AB	1
S.H.M curve drawn & correct	1	Link CBE	1
Dwell	1		
U.A.R construction	3		
U.A.R curve drawn & correct	1	<b>LOCUS</b>	<b>16</b>
Dwell	1	Circle OA divided into 12 parts	1
Presentation	2	CD divided into 6 parts	1
		Location of points B	6
		Location of points E	3
<b>CAM PROFILE</b>	<b>16</b>	Locus drawn & correct	3
Rotation correct	1	Presentation	2
Nearest approach correct	2		
Heights projected and swung	1		
Roller followers drawn	1		
Intermediate angles for SHM/UAR	3		
S.H.M drawn & correct	1		
Dwell arc drawn & correct	2		
U.A.R drawn & correct	1		
Dwell arc drawn & correct	2		
Presentation	2		

**MARKING SCHEME: QUESTION 3**

(a)	GIVEN VIEWS	4
(b)	TRUE LENGTHS	12
(c)	DEVELOPMENT	21
(d)	SHEET SIZE	3
(e)	SHEET METAL JOINTS	<u>10</u>
TOTAL		50 Marks

<b>GIVEN VIEWS</b>	<b>(4)</b>
Elevation correct	2
Plan correct	2

<b>TRUE LENGTHS</b>	<b>(12)</b>
Cylinder divided into 12 parts	1
Surface divided into triangles	2
True lengths obtained/identified	6
T/L layout	2
Identification system	1

<b>DEVELOPMENT</b>	<b>(21)</b>
Triangular area correct (13 triangles)	13
Cylinder area correct (3 divisions)	3
Curve drawn and smooth	2
Seam correct	1
Presentation	2

<b>SIZE OF RECTANGULAR SHEET (3)</b>	
Minimum sheet size shown/stated	3
(sheet construction = 1)	
(sheet size between 2.35 & 2.4 m <sup>2</sup> = 2)	

<b>SHEET METAL JOINTS</b>	<b>(10)</b>
Joint for seam S-S	2
Joint name	1
Safe edge for open bottom	2
Joint name	1
Connection joint	3
Joint name	1

Note: Other seams, edges and connections acceptable.

**MARKING SCHEME: QUESTION 4**

(a)	ISOMETRIC DRAWING	35	
(b)	UNIVERSAL JOINT	<u>15</u>	
		Total	50 Marks

<b>ISOMETRIC DRAWING</b>	<b>(35)</b>	<b>UNIVERSAL JOINT</b>	<b>(15)</b>
<b>Vee Block</b>	<b>8</b>	Centre lines	1
Front outline	1	Driving fork detail	3
Top/bottom vee front	2	Driven fork detail	3
Left/right slots front	1	Spider detail	3
Left surfaces	2	Additional detail (shafts, keys, circlip)	3
Top surfaces	2	Line work and presentation	2
<b>Stirrup</b>	<b>10</b>		
Left leg	2		
Right leg	2		
Isometric semicircle/arcs	3		
Top projection	1		
Screw threads	1		
Tangent	1		
<b>Clamping Screw</b>	<b>7</b>		
Isometric circle/arc screw head	2		
Clamp head thickness	1		
Knurling	1		
Shank length	1		
Shank & threads	1		
Isometric arc screw	1		
<b>VIEW DETAILS</b>	<b>10</b>		
Isometric drawing provided	1		
Correct viewpoint	1		
Method of assembly shown	1		
Construction for isometric circles	3		
Construction for angles	1		
Centre lines	1		
Presentation	2		

**MARKING SCHEME: QUESTION 5**

(a)	PUMP HOUSING		46
(b)	ADDITIONAL REQUIREMENTS		<u>4</u>
		TOTAL	50 Marks

<b>PUMP HOUSING</b>	<b>(42)</b>	<b>END ELEVATION</b>	<b>11</b>
<b>SECTIONAL ELEVATION</b>	<b>17</b>	Projected correctly	1
Centre lines	1	Centre lines	1
126mm base flange	1	Oval flange area	1
Two 10mm flange holes/slot	1	46mm x 66mm cylinder and boss	1
100mm x 6 mm recess	1	Mounting bracket and holes	1
Wall thickness 10mm	1	100mm x 70mm cylinder	1
34mm hole	1	Raised area/slot	1
Wall thickness 6mm	1	Base flange area	1
Oval flange	1	Fillets and intersection curve	2
Web	1	Presentation	1
Mounting bracket	1		
Fillets	1	<b>ADDITIONAL REQUIREMENTS (4)</b>	
Hidden detail/ surface lines removed	1	(i) Four dimensions	2
Correct areas hatched	3	(ii) Projection symbol	1
Presentation	2	(iii) Title: Pump Housing	1
<b>SECTIONAL PLAN</b>	<b>18</b>		
Projected correctly	1		
Centre lines	1		
34mm section	1		
M10 hole/ boss	1		
Thread convention used	1		
Web area	1		
Mounting bracket area	1		
Two 14mm mounting holes	1		
Flat surface	1		
126mm base flange	1		
Three 10mm flange holes	1		
Boss projection/ slot	1		
Fillets	1		
Hidden detail/ surface lines removed	1		
Correct areas hatched	2		
Presentation	2		

**MARKING SCHEME: QUESTION 6A**

(a)	SPUR GEAR	25
(b)	FREEHAND SKETCH CYLINDER	<u>25</u>
	TOTAL	50 Marks

<b>SPUR GEAR</b>	<b>(25)</b>	<b>FREEHAND SKETCH</b>	<b>(25)</b>
<b>GEAR TEETH</b>	<b>16</b>	<b>SECTIONAL ELEVATION</b>	<b>17</b>
Centre lines	1	Rod details	2
PCD	1	Piston details	1
Addendum circle	1	Cylinder details	2
Dedendum circle	1	Cylinder cover details	2
Base circle	1	Mounting end details	2
Tooth thickness	1	Guide bush	1
Construction of tooth profile <i>(involute curve or any recognised approximate method acceptable)</i>	4	Rod seal	1
Root radii drawn	1	Cylinder seal	1
Second tooth drawn	2	Piston seal	1
Presentation	3	Scale and proportion	2
(F=1 G=2, Ex=3)		Presentation/ Line work	2
 <b>TABLE OF GEAR VALUES</b>	 <b>9</b>	 <b>SKETCH REQUIREMENTS</b>	 <b>8</b>
Calculations and formulae shown	1	Drawn in extended position	2
Gear Data (6 off x 1 mark each)	6	Labelling of five parts	5
Table drawn	1	(Piston 1)	
Presentation	1	(Cylinder 1)	
		(Rod seal 1)	
		(Piston seal 1)	
		(Cylinder seal 1)	
		Presentation/ Lettering	1

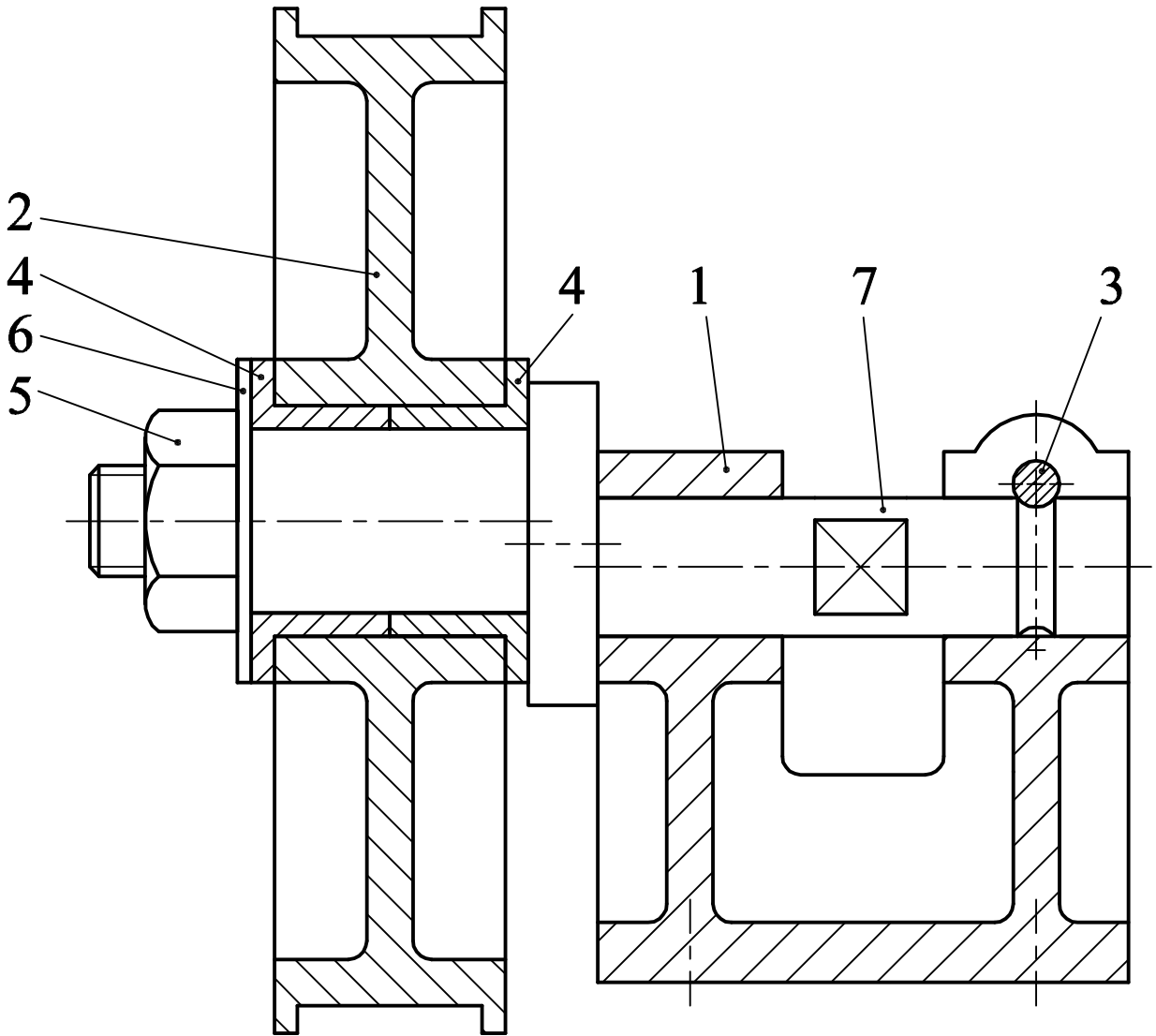
**MARKING SCHEME: QUESTION 6B**

(a)	SHORT CAD QUESTIONS	12
(b)	3D MODEL	10
(c)	CAD COMMAND PAIRS	11
(d)	CAD PROFILE	<u>17</u>
Total		50 Marks

<b>SHORT CAD QUESTIONS</b>	<b>(12)</b>	<b>CAD PROFILE</b>	<b>(17)</b>
(i) Four advantages of CAD	2	Sheet size	1
(ii) Two input and output devices	2	Semi ellipse	3
(iii) Two downloading problems	2	Circle 1	1
(iv) Two template settings	2	Circle 2	1
(v) Use of Layers	2	Circle 2 Array	2
(vi) Baseline dimensioning	2	Line AB	1
(vii) Aliasing	2	Line BC	1
(viii) Parametric CAD System	2	Line Array	2
<i>Maximum 12 marks</i>		Arc	1
		Line	1
		Fillet	1
		Text	1
		Presentation	1

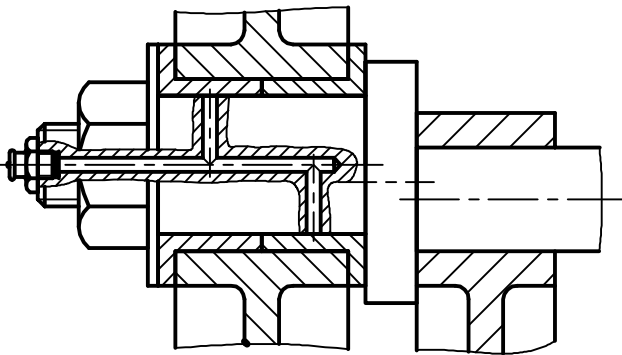
<b>3D MODEL</b>	<b>(10)</b>
CAD package	1
Commands used to draw the model	9
(Explanation 5)	
(Sketches 4)	

<b>CAD COMMAND PAIRS</b>	<b>(11)</b>
(i) Extend/Lengthen	2
(ii) Lineweight/Linetype	2
(iii) Pan/ oom	2
(iv) Wireframe/Surface models	2
(v) Viewpoint/Viewport	3



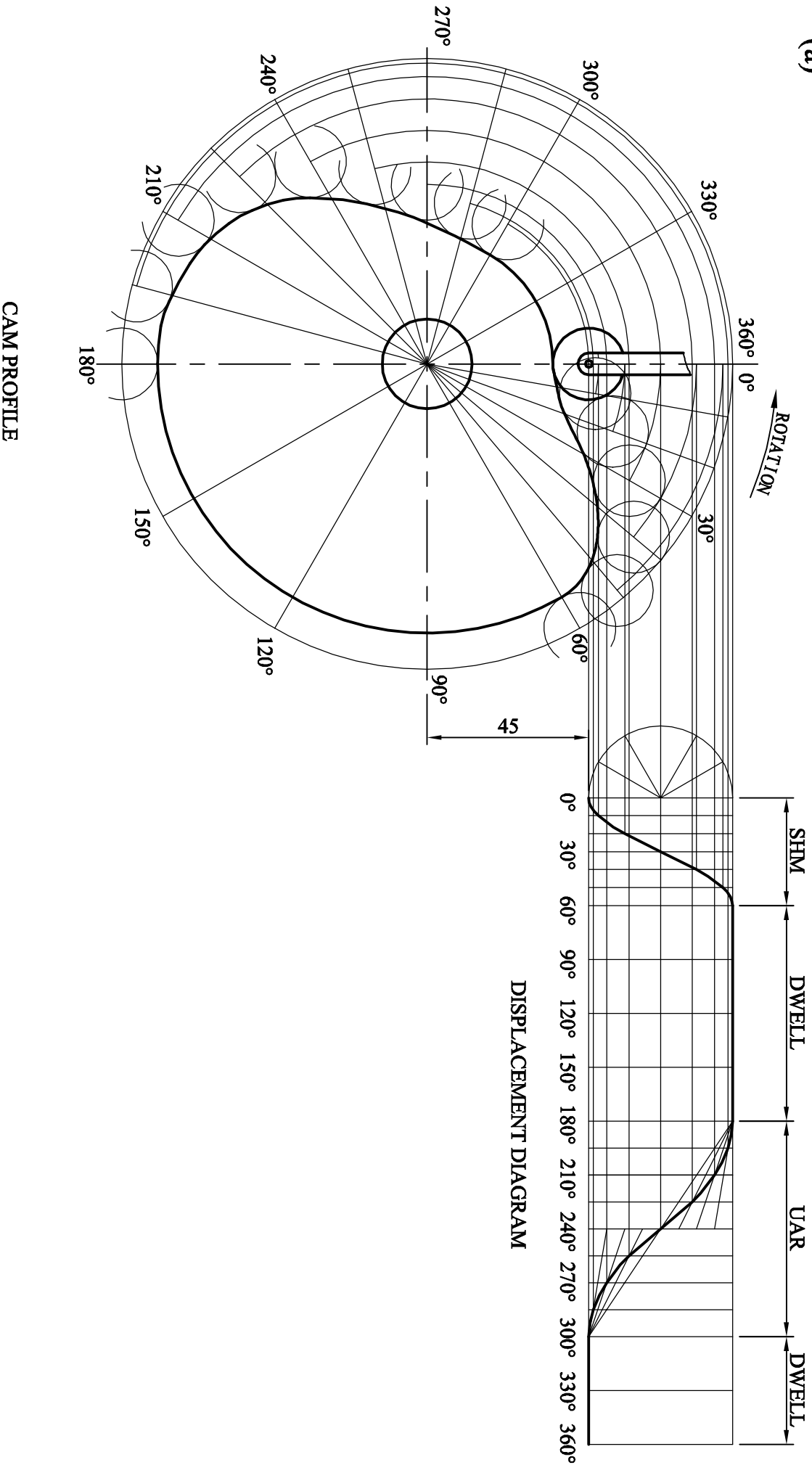
**BELT TENSIONING UNIT**

Drill shaft and fit  
suitable oil/grease  
lubricator.



**MODIFICATION**

(a)

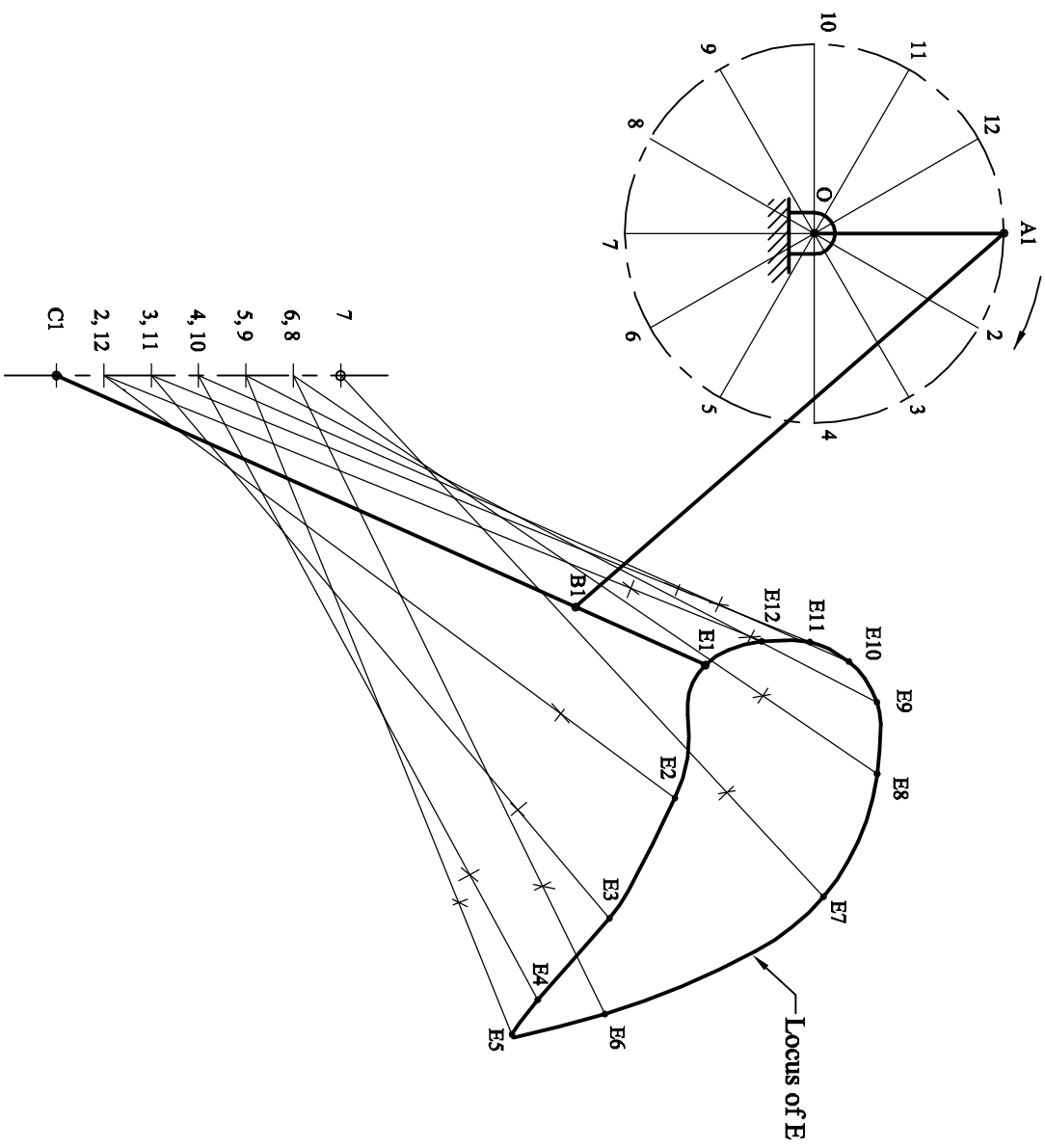


CAM PROFILE

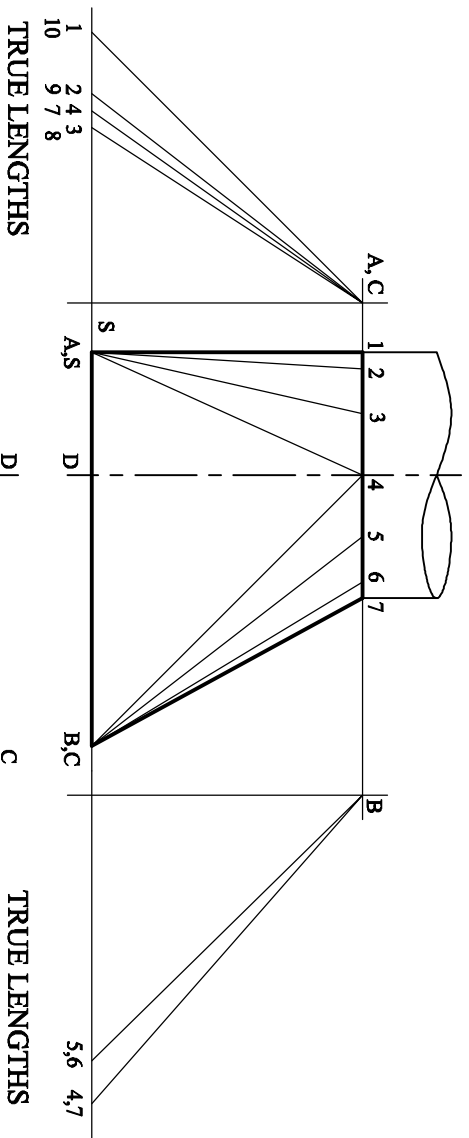
DISPLACEMENT DIAGRAM



(b)

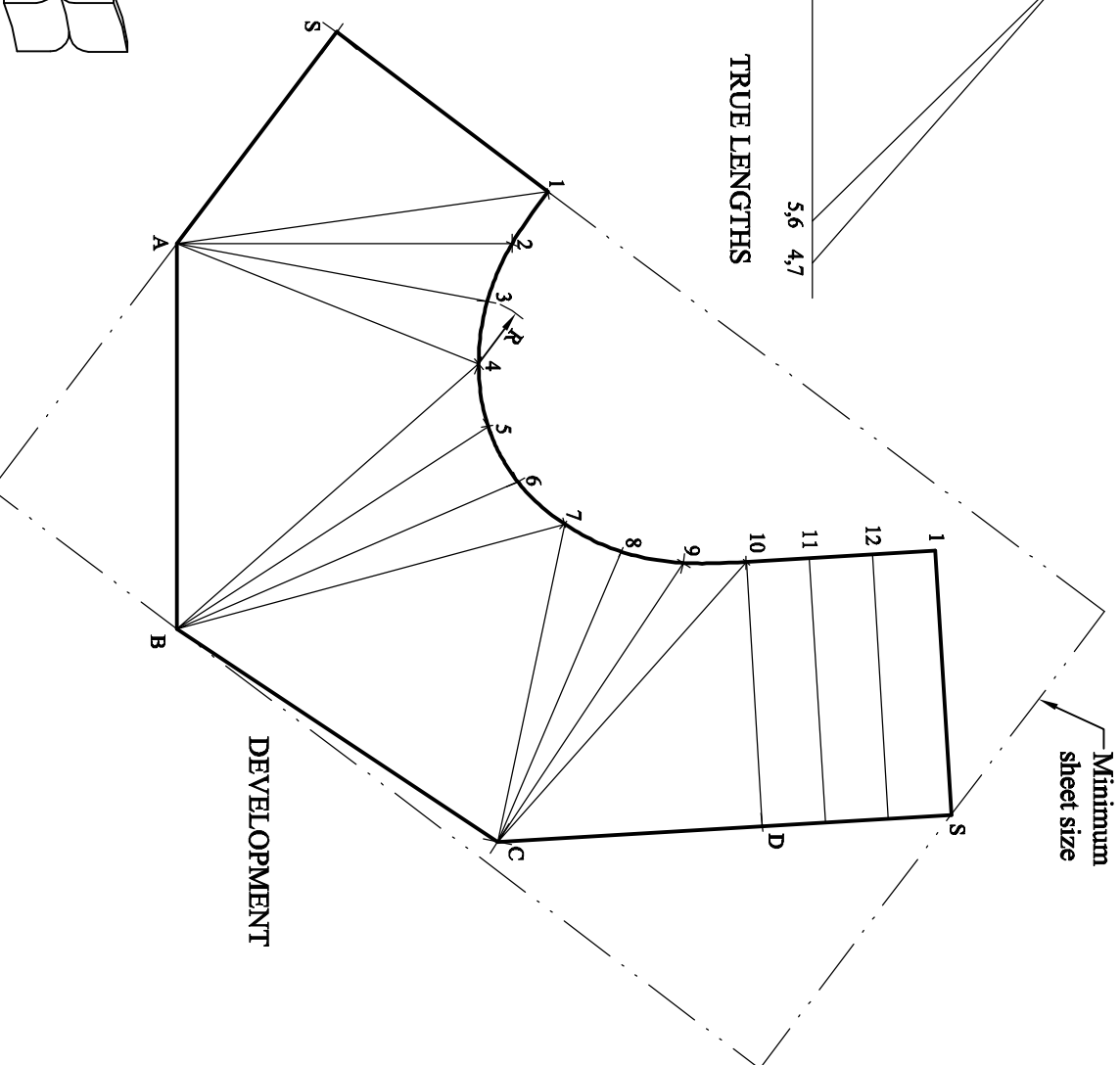
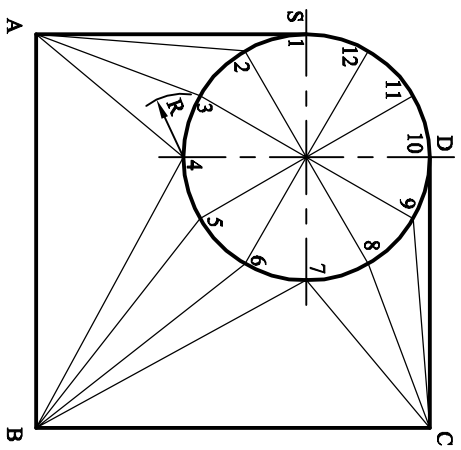


(a)

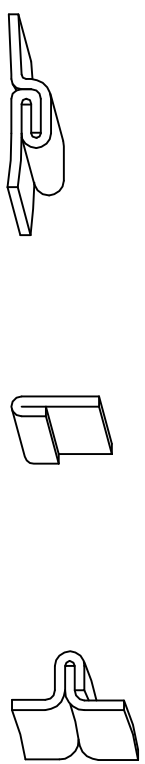


(b)

Minimum sheet size: 1190 mm x 2000 mm

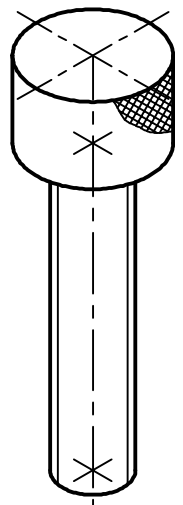


(c)

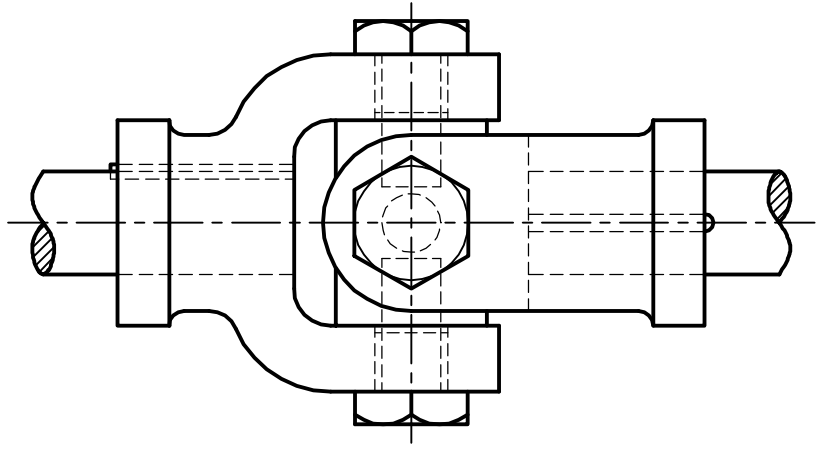


(i) External Grooved Seam (ii) Single Hem Edge (iii) Panned Down Joint

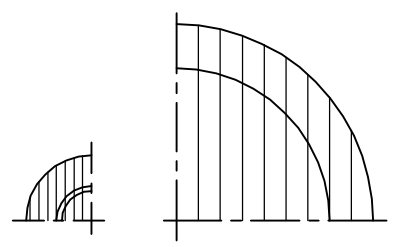
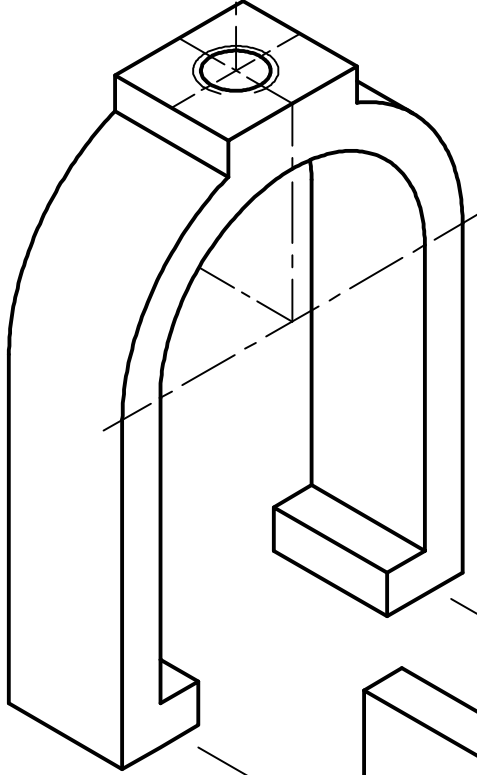
(a)



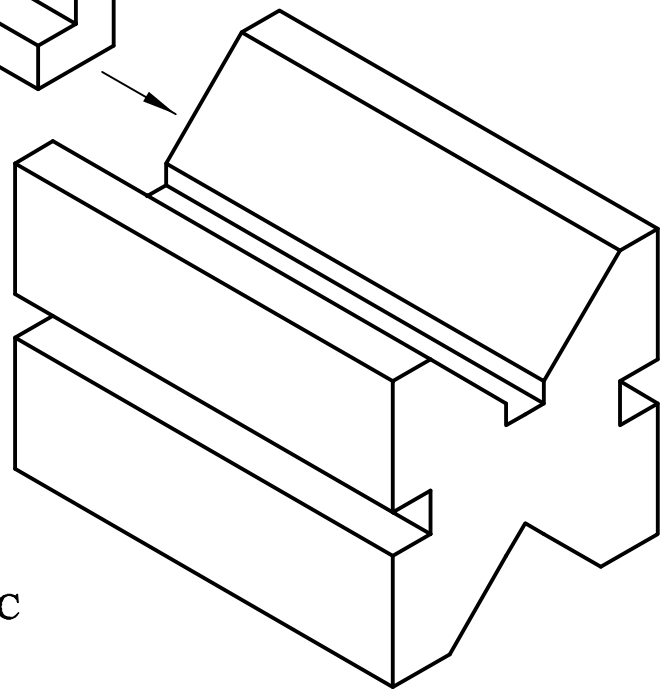
(b)



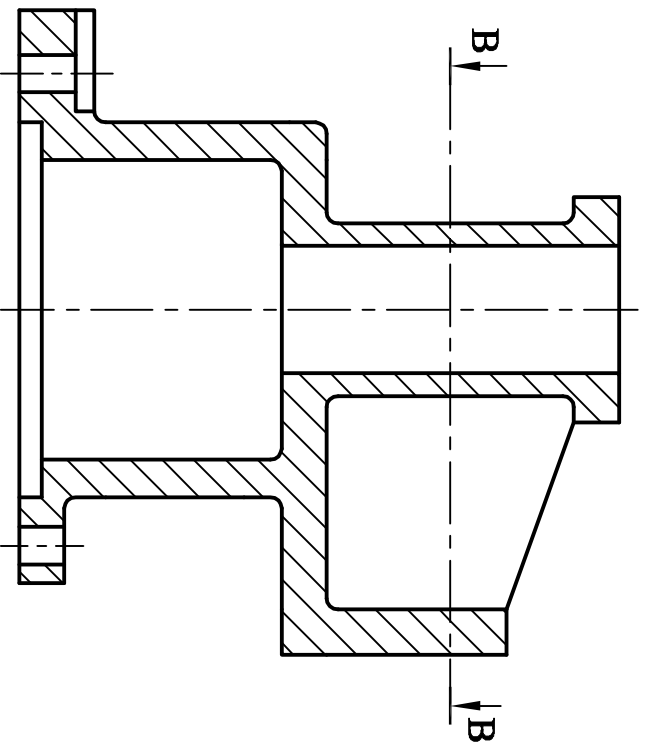
UNIVERSAL JOINT



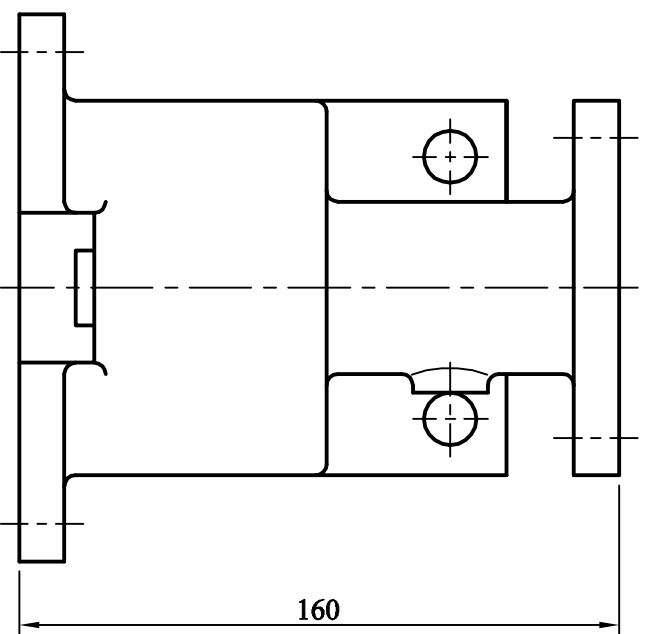
Construction for isometric circles



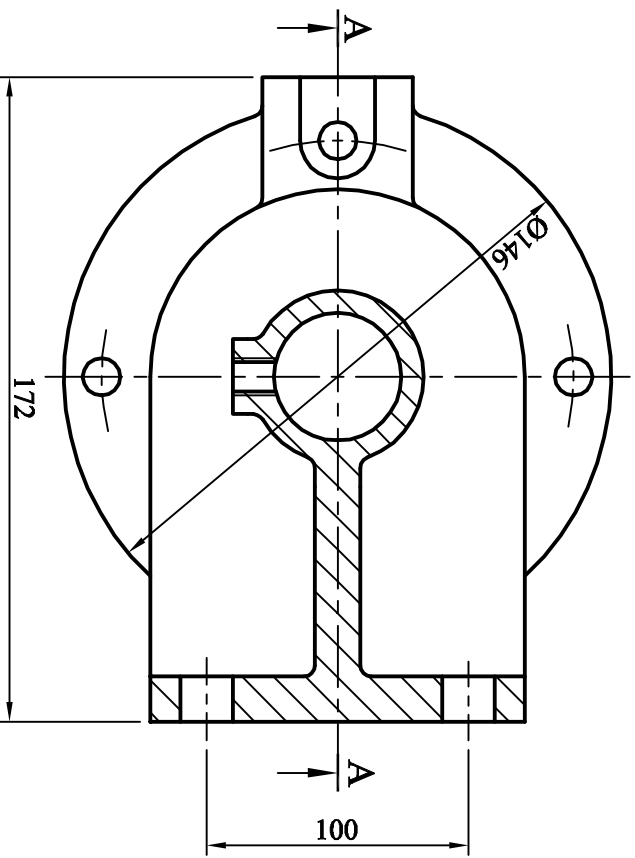
EXPLODED ISOMETRIC



SECTION A-A

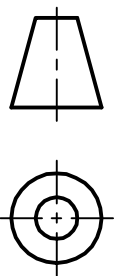


END ELEVATION

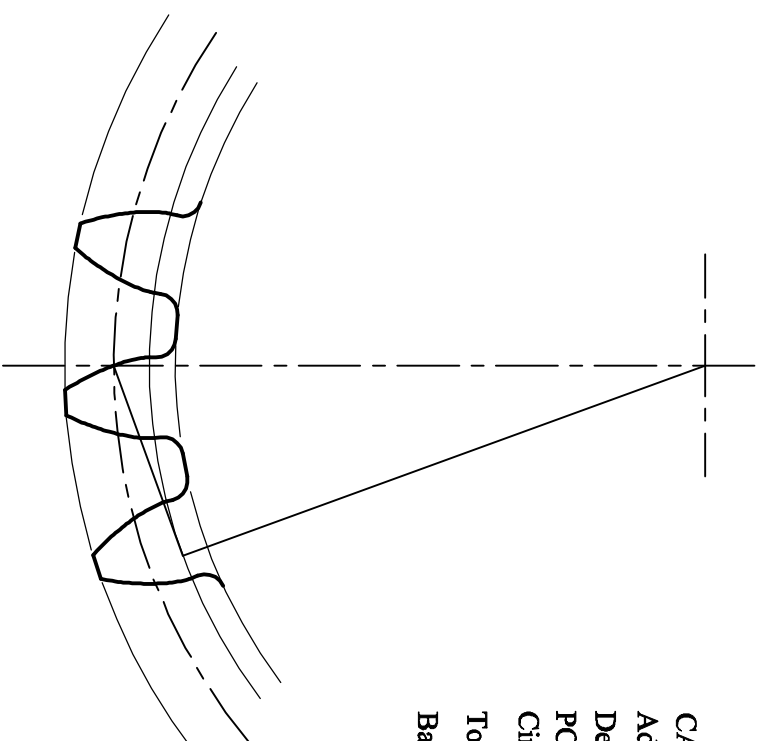


SECTION B-B

PUMP HOUSING



(a)



CALCULATIONS

Addendum = module = 10mm

Dedendum = 1.25 x module = 1.25 x 10 = 12.25mm

PCD = m x T = 10 x 24 = 240mm

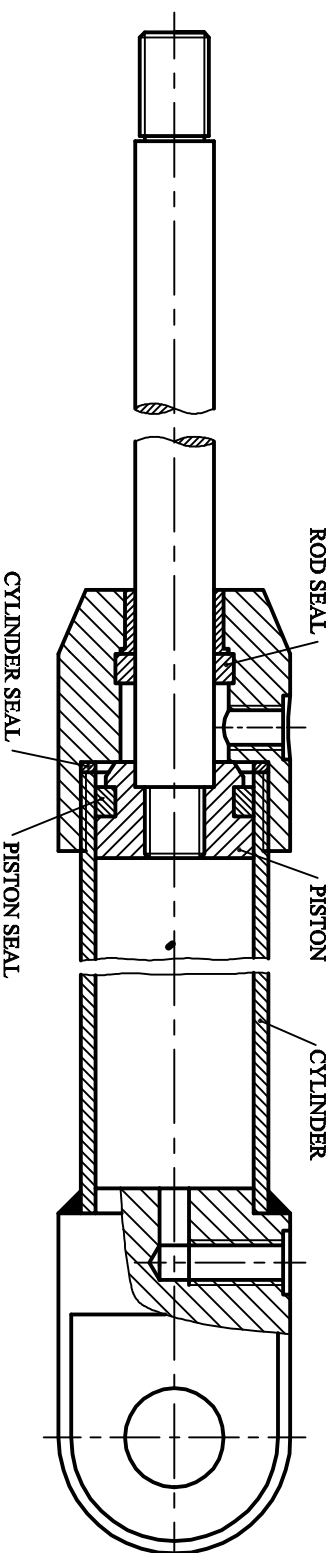
Circular pitch p = pi x m = 3.142 x 10 = 31.42mm

Tooth thickness =  $\frac{p}{2}$  =  $\frac{31.42}{2}$  = 15.71mm

Base circle = Cos 20° x PCD = 0.939 x 240 = 225.5 mm

SPUR GEAR TABLE	
Addendum	10
Dedendum	12.25
Pitch circle diameter	240
Circular pitch	31.42
Tooth thickness	15.71
Base circle diameter	225.5

(b)



UNIVERSAL CYLINDER

(a) (i) Advantages of CAD: Higher productivity, faster and easier creation of drawings which can be easily retrieved and modified.

Outstanding presentation possible, rendering allows photo realistic images with full animation.

Ability to store frequently used parts in libraries.

Automatic creation of elevations, cross sections and bill of materials.

Testing of the design using finite element analysis and so on.

(ii) Input Devices: keyboard, 2D/3D scanner, digitizer, TFT touch -screen, tracker ball, light pen, digital camera, GPS equipment, 3D mouse etc.

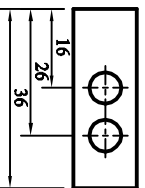
Output Devices: Display devices, Plotters, 3D printer, CNC machine tools etc.

(iii) Potential problems: (i) security issues- download file might be hiding spyware or malware (identity thieves and hackers), viruses and trojans, corrupt spoofing files, popup ads, deceptive links etc. (ii) large file size, download speed, file might not unpack, file might be corrupted, computer might crash, risk of breaking copyright laws, etc

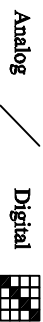
(iv) A drawing template contains saved standard settings and conventions, such as title block, units, precision, layer settings, snap, linetype settings, text styles etc.

(v) Layers are imaginary transparent surfaces that can be created within CAD. You can draw on these imaginary surfaces and group drawing objects on different layers. This helps to organize CAD drawings and makes editing much easier as layers can be turned On or Off to view or edit specific objects.

(vi) Baseline dimensioning



(vii) Aliasing happens when analog data (lines/curves) are represented on a digital system. The diagonal line appears choppy across a set of pixels 'staircasing effect'.



(viii) Parametric CAD system refers to the use of numeric parameters of an object to define the object. The user enters the relevant sizes and the cad system automatically generates a drawing of the object. For example in a parametric system a 3D box might be defined by length, width, and height. Since the system stores the box as a standard process with a set of defining parameters, it is simple to change any parameter at any time to obtain a new version of the box, changing a parameter changes the box.

(b) Package: Solid Edge V17.

STEPS:

(i) Select reference plane and sketch profile of base and protrude (extrude).

(ii) Select plane- left side face, draw hole circle, set hole parameters and define extent/depth all the way through.

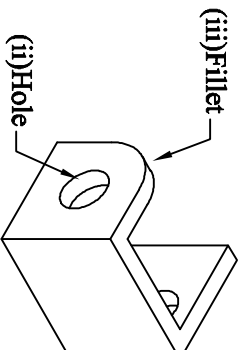
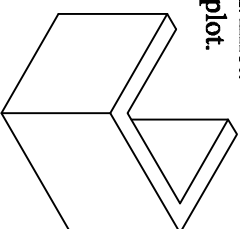
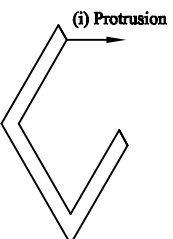
(iii) Insert rounds/filletlets on the four corners.

(iv) Select plane- front surface draw circle and protrude (extrude) outwards.

(v) Select front face of cylinder, draw hole circle, set hole parameters and define depth.

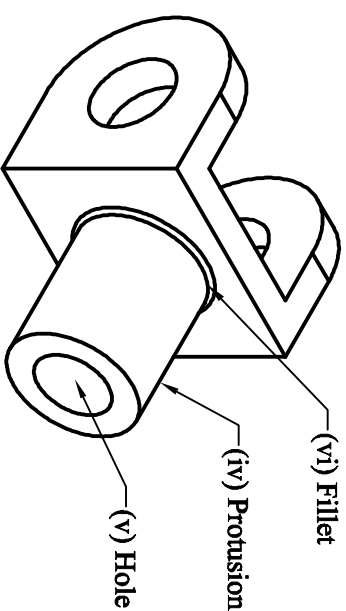
(vi) Insert the rounds/fillet.

(vii) Save and print/plot.



Step (i)

Step (ii & iii)



(c)

(i) **EXTEND**: Extend lengthens the end of an object to meet another object.  
**LENGTHEN**: Changes the length of objects and the included angle of arcs.

(ii) **LINETYPE**: A linetype is a repeating pattern of dashes, dots, and blank spaces displayed in a line or a curve (dashed, zig zag etc).  
**LINEWEIGHT**: Using linewidths, you can create heavy and thin lines of various thickness. Thin lines for dimensions and tick lines for outlines.

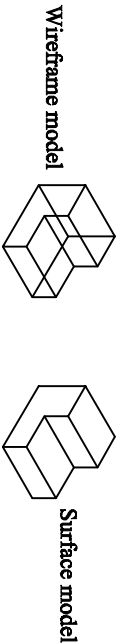
(iii) **PAN**: Lets you shift (scroll) the location of your view of a drawing. PAN does not change the location or magnification of objects on your drawing; it changes only the view.

**ZOOM**: You can change the magnification of a view by zooming in and out, which is similar to zooming in and out with a camera. Zoom does not change the absolute size of objects in the drawing; it changes only the magnification of the view.

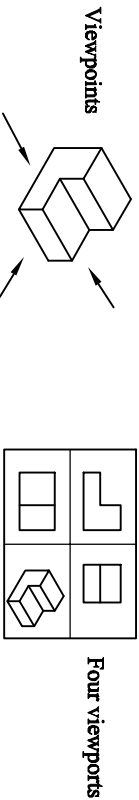


(iv) **WIREFRAME MODEL**: A wireframe model is an edge or skeletal representation of a real-world 3D object using lines and curves. The model does not contain any information about the surface, volume or mass of the object.

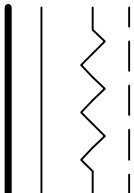
**SURFACE MODEL**: Overcome the limitations of wireframe models by creating faceted surfaces using a polygonal mesh and this makes visualisation of the model easier.



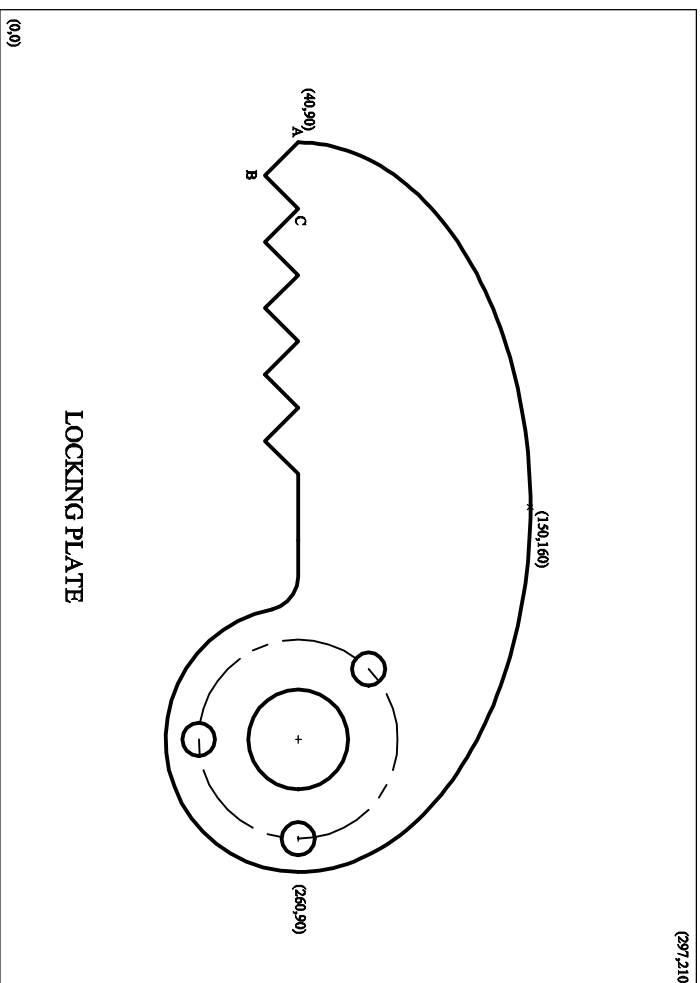
(v) **VIEWPOINT**: Is a 3D visualization command and lets you set the direction and angle for viewing a 3D model i.e. top, side, rear, etc.  
**VIEWPORT**: Lets you divide your screen into several viewing areas. Each viewport can display a different view of your drawing.



Extend  
.....



(d)



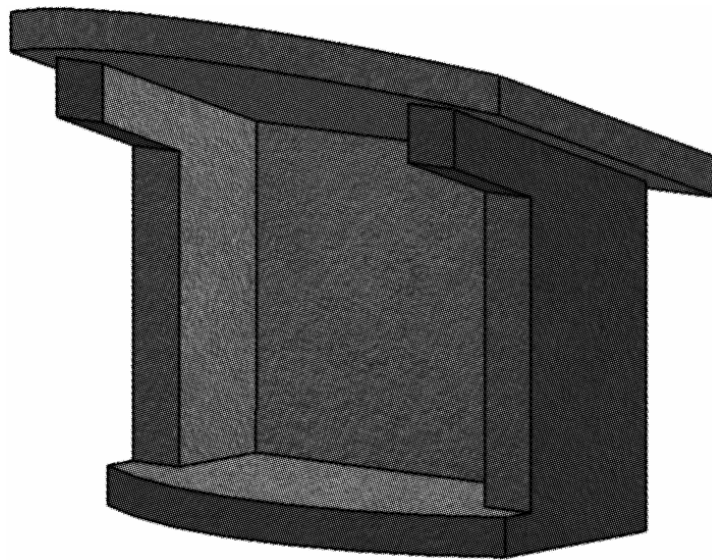


**Coimisiún na Scrúduithe Stáit**  
***State Examinations Commission***

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*Leaving Certificate Examination 2007*

***Technical Drawing***  
***Paper 2 - 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>4</b>
2. Position spectator and plan of picture plane (1, 3) .....	<b>4</b>
3. Plan of vanishing points .....	<b>4</b>
4. Ground line, horizon line, vanishing points in elevation (1, 1, 2) .....	<b>4</b>
5. Projection lines from plan to spectator .....	<b>3</b>
6. Perspective of straight line on base of shelter .....	<b>2</b>
7. Measure height 1 and draw outline of straight parts of base (2, 3) .....	<b>5</b>
8. Construction for determining points on curves a and b .....	<b>2</b>
9. Complete outline perspective of base of shelter .....	<b>2</b>
10 Measure and apply heights 2 and 3 .....	<b>2</b>
11. Determine auxiliary vanishing point (or alternative) .....	<b>2</b>
12. Complete perspective view of blocks A and B (3, 2) .....	<b>5</b>
13. Measure height 6 (or 4 and 5) and complete roof elements .....	<b>7</b>
14. Presentation of perspective view .....	<b>4</b>
	<b>Total..... 50</b>

**QUESTION 2**

<b>Part (a) 17</b>	<b>MARKS</b>
1. Set up given dimensions for surfaces A and C in plan .....	3
2. Draw edge views of surfaces A and C (3, 3) .....	6
3. Draw ridge line between surfaces A and C in plan, height in elevation .....	4
4. Complete plan and elevation of roof surface A (2, 2) .....	4
<b>Part (b) 15</b>	
5. Construction to determine horizontal trace of surface B .....	4
6. Complete plan of surface B, draw elevation of surface B .....	2
7. View showing true length of line of intersection between A and B .....	4
8. Construction to find dihedral angle .....	3
9. Indicate dihedral angle .....	2
<b>Part (c) 8</b>	
10. View showing true length of line of intersection between A and D .....	3
11. Construction to determine trace of surface D in plan.....	3
12. Complete plan and elevation of roof (1, 1) .....	2
<b>Part (D) 10</b>	
13. Draw lines of intersection g and h in plan and elevation.....	2
14. Set up given dihedral angle of 140° in plan .....	1
15. Edge view of rebatting triangle, rotation (1, 1) .....	2
16. Construction to determine H.T. of line of intersection between E and F.....	3
17. Complete the plan of surfaces E and F .....	2
Total.....	<b>50</b>

**QUESTION 3****Given Plan and Elevation (10)****MARKS**

- |   |          |
|---|----------|
| 1. Draw the given plan and elevation (4, 4) .....     | <b>8</b> |
| 2. Draw light rays in plan and elevation (1, 1) ..... | <b>2</b> |

**Shadow and Shade in plan and elevation (40)**

- |  |          |
|--|----------|
| 3. Determine points a, b, c, d, e on ground .....                              | <b>9</b> |
| 4. Complete shadow cast by building on ground, presentation (6, 3) .....       | <b>9</b> |
| 5. Determine points f, g, r in elevation (1, 1, 1) .....                       | <b>3</b> |
| 6. Draw shadow cast by block C on front wall of block A .....                  | <b>3</b> |
| 7. Determine points h, i, j, k, r in elevation and plan (2, 2) .....           | <b>4</b> |
| 8. Draw plan and elevation of shadow cast by block C on roof of A (2, 2) ..... | <b>4</b> |
| 9. Determine points l and p in plan and elevation .....                        | <b>2</b> |
| 10. Draw shadow cast in plan and elevation cast by A on roof of block B .....  | <b>2</b> |
| 11. Determine points m, n, o in plan and elevation .....                       | <b>2</b> |
| 12. Complete shadow cast by block C on roof of block B .....                   | <b>2</b> |

Total..... **50**

**QUESTION 4**

	<b>MARKS</b>
1. Set up given dimensions in elevation, circular arc .....	4
2. Set up given dimensions in plan, draw circle.....	4
3. Construction for parabola ABC .....	5
4. Draw parabola ABC and extend .....	6
5. Determine height H for point D in elevation (14m width on ABC) .....	3
6. Construction for parabola BD in elevation .....	5
7. Draw parabola BD and extend .....	4
8. Measure heights (e.g. X) from elevation on ABC to determine points (e.g. e, f) on curves CE and AF in plan .....	3
9. Draw curves CE and AF in plan .....	2
10. Measure heights (e.g. P) to determine points J and K in plan.....	2
11. Complete curves C to J and A to K in plan.....	2
12. Measure ht. (e.g. Y) from elev. on ABC to find width for points g, h .....	4
13. Complete plan .....	2
14. Measure widths ( e.g. S) to determine height R to find points i, j in elev.....	2
15. Complete elevation .....	2
Total .....	<b>50</b>

**QUESTION 5**

<b>(a) Set up, Dip, Strike &amp; Thickness of Stratum (34)</b>	<b>MARKS</b>
1. Outline of bore-holes in plan, points A and B in elevation (2,2,1,1) .....	<b>6</b>
2. Bore-hole A in elevation, points 1 and 3 in elevation and plan (2, 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>1</b>
9. Direction of auxiliary elevation, dip and thickness (1, 1, 1) .....	<b>3</b>
 <b>(b) Points R and S on stratum (16)</b>	
10. Draw line RS in plan, point R in elevation (1, 1) .....	<b>2</b>
11. Set up given strike in plan .....	<b>2</b>
12. Direction for auxiliary view, set up XY line, R in aux. view .....	<b>2</b>
13. Set up given dip angle in auxiliary view .....	<b>1</b>
14. Project point S to auxiliary view to determine altitude of S .....	<b>1</b>
15. Determine true angle between line RS and strike line, indicate angle .....	<b>8</b>
<b>Total.....</b>	<b>50</b>

**QUESTION 6**

**(a) Plan and Elevation (25)**

**MARKS**

- 1. Draw the given outline plan, elevation of pentagonal perimeter (3, 3)..... 6
- 2. Draw elements on ADCB and ABEF in plan, project to elevation (3, 3) ..... 6
- 3. Extend elements on ABCD in plan to circular perimeter ..... 3
- 4. Extend elements in elevation..... 3
- 5. Method for determining curves in elevation ..... 3
- 6. Complete elevation ..... 4

**(b) Curvature along C and F (11)**

- 7. Draw line CF in plan, proj. of int. with elements to elements in elev..... 4
- 8. Set up XY line parallel to CF, projections at right angles to CF ..... 2
- 9. Measure heights from elevation in auxiliary view ..... 2
- 10. Draw curve ..... 3

**(c) Traces of plane director (14)**

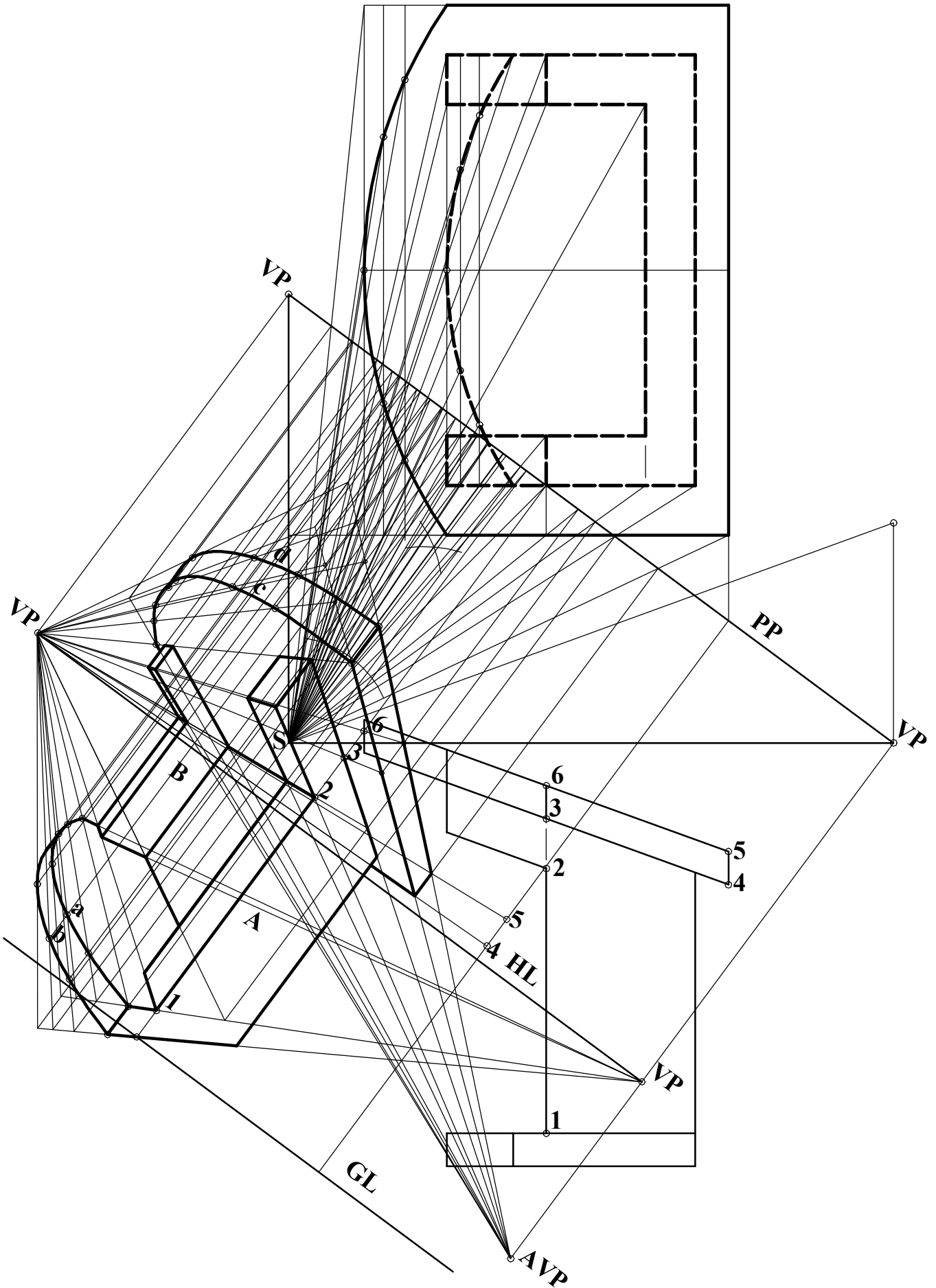
- 11. Plane parallel to element in plan..... 2
- 12. Plane parallel to element in elevation ..... 2
- 13. Determine horizontal trace in correct location ..... 3
- 14. Determine vertical trace ..... 1
- 15. Determine angle of plane director to VP, distance from F to plane..... 6

Total..... 50

**QUESTION 7**

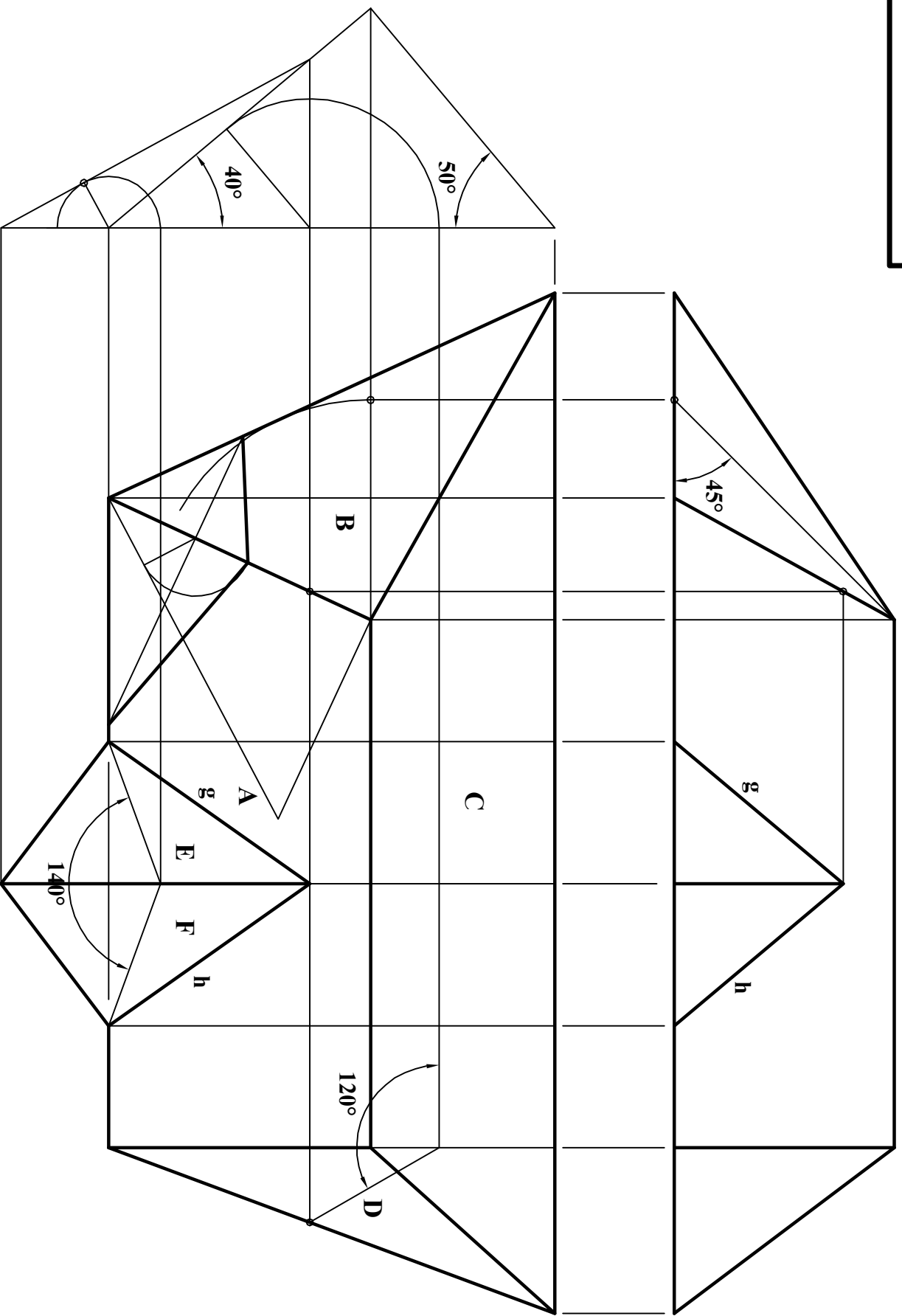
<b>Earthworks between A and B    Level    cutting ( 10)</b>	<b>MARKS</b>
1. Parallel arcs at 7.5m intervals .....	4
2. Intersections with contours, drawing curves .....	6
<b>Earthworks between B and C    Embankments (7)</b>	
3. Determine arc rad. 30 m at 55m level, draw tangents from 40m level .....	2
4. Drawing parallel lines at 10m.....	2
5. Intersections with contours, drawing curves .....	3
<b>Earthworks between B and C    Cuttings (7)</b>	
6. Determine arc rad. 22.5 m at 40m level, draw tangents from 55m level .....	2
7. Determine parallel lines at 7.5m intervals .....	2
8. Intersections with contours, drawing curves .....	3
<b>Earthworks between C and D    Embankments (8)</b>	
9. Determine arcs at 55m (c), tangents from 50m level .....	2
10 Parallel line at 10m intervals .....	3
11. Intersections with contours, drawing curves .....	3
<b>Earthwork between C and D    Cuttings (8)</b>	
12. Determine arcs at 50m level, tangents from C .....	2
13. Parallel lines at 7.5m intervals.....	3
14. Intersections with contours, drawing curves .....	3
<b>Completion (6)</b>	
15. Determine intersections of cut and fill curves, presentation.....	6
<b>Gradient (4)</b>	
16 Construction to determine gradient between B and C .....	2
17. Indicate gradient.....	2
Total.....	<b>50</b>

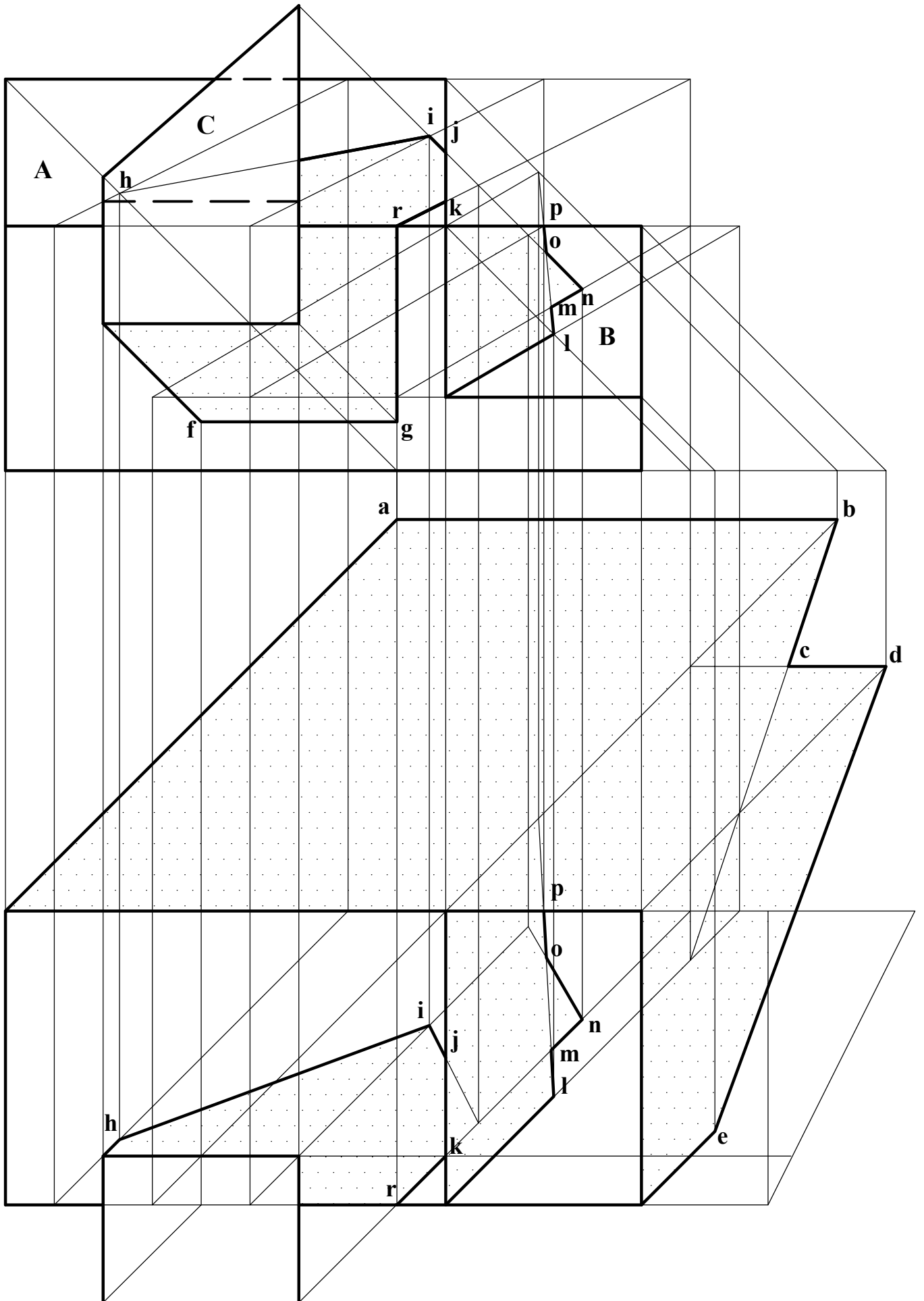
# QUESTION 1





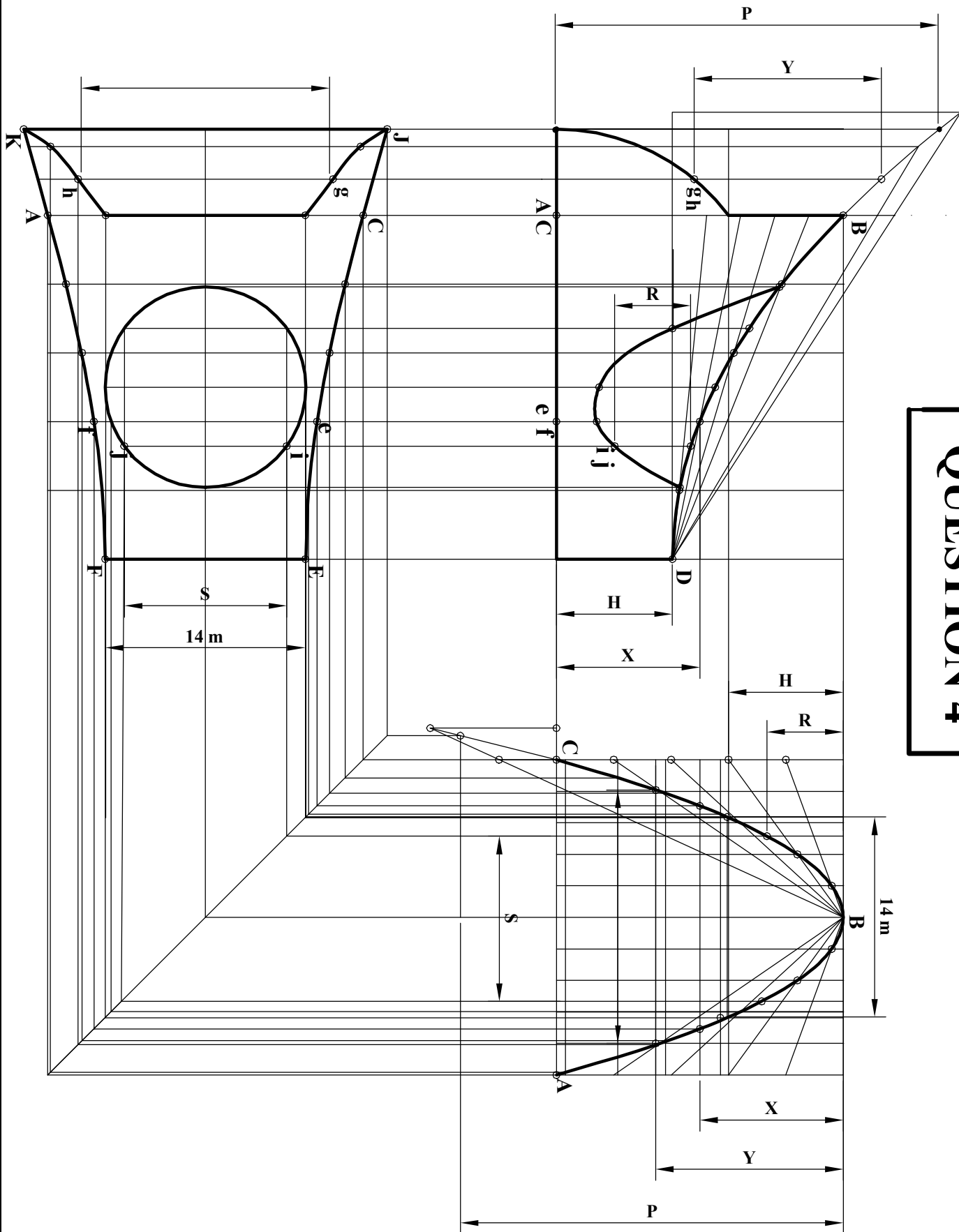
# QUESTION 2



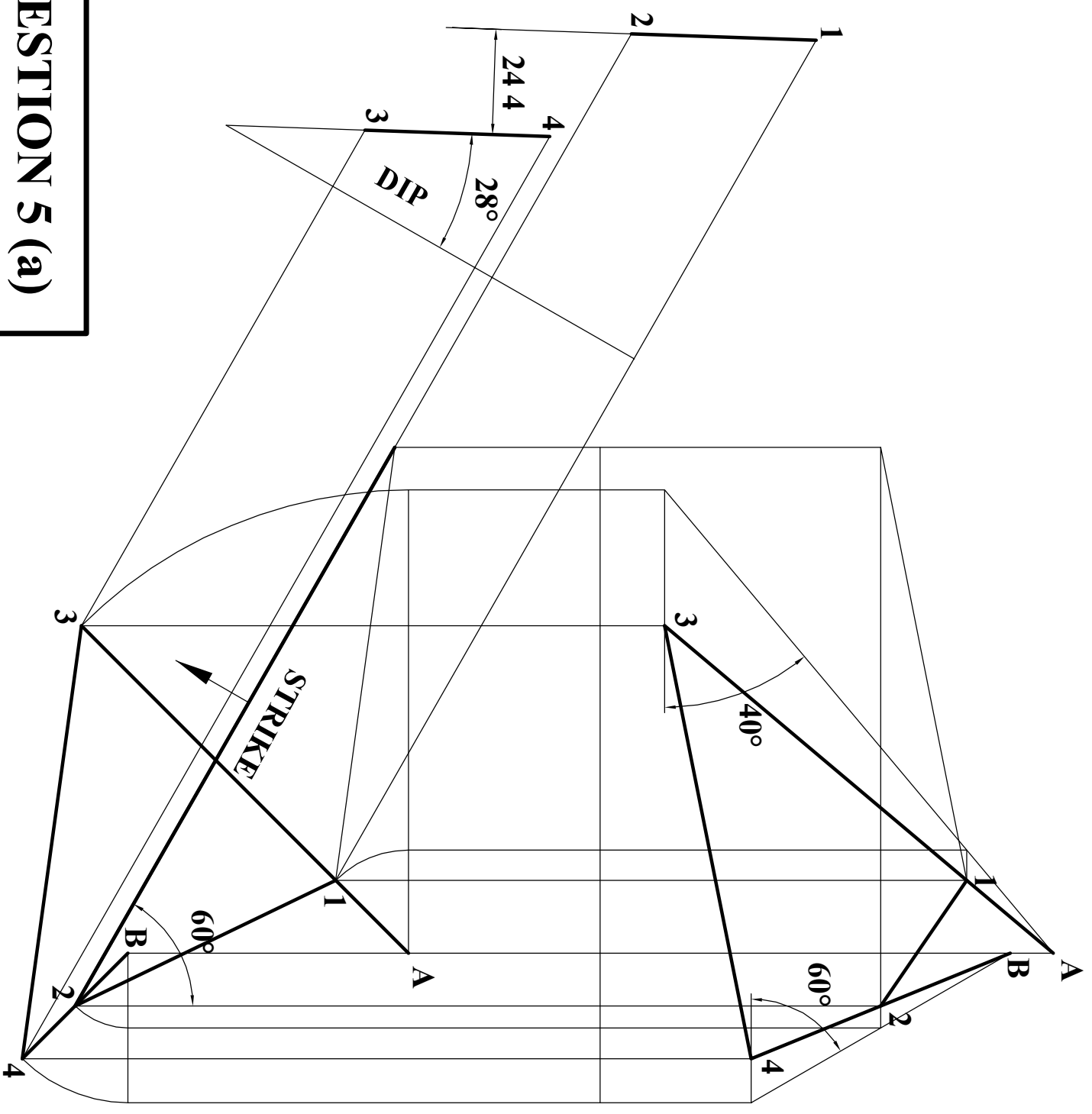


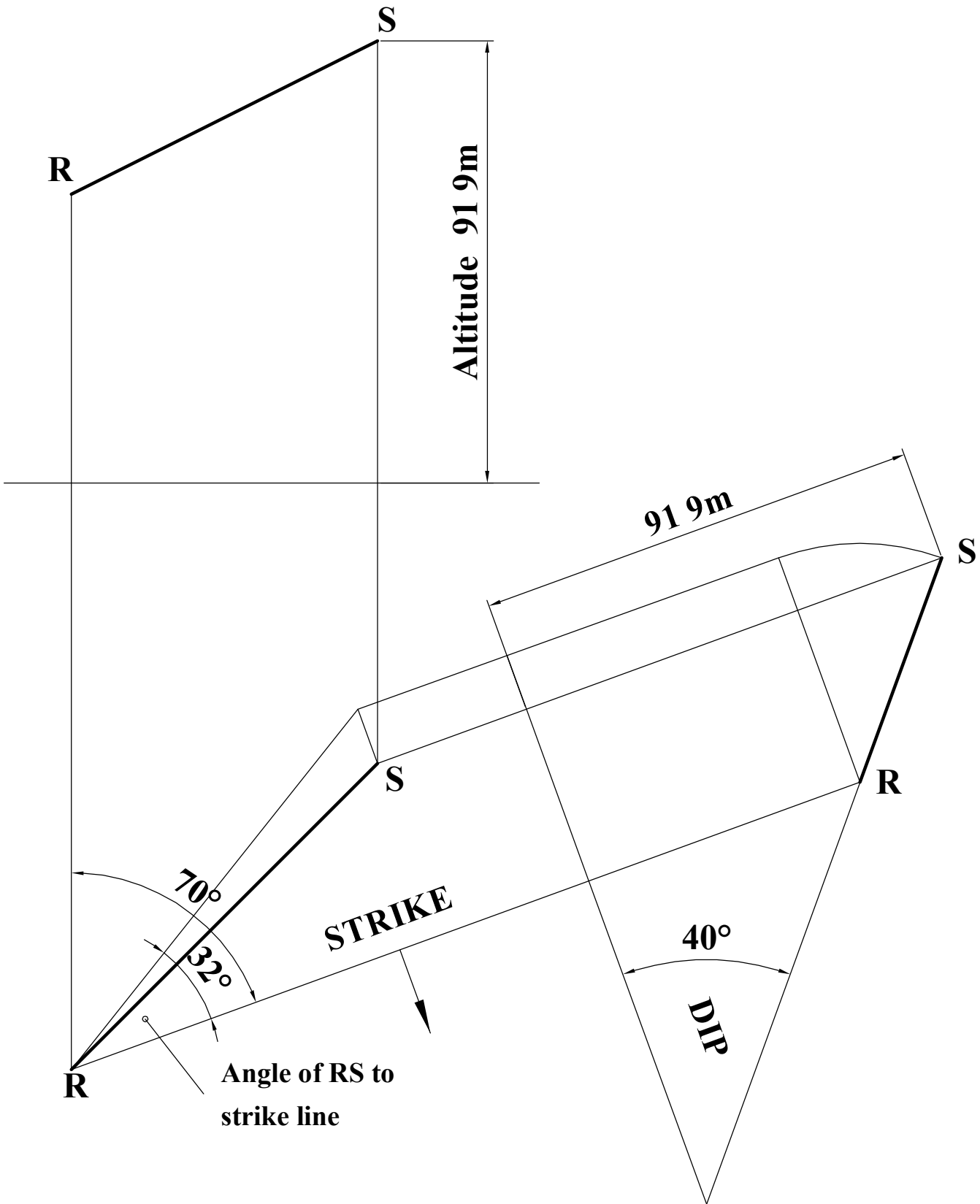
**QUESTION 3**

# QUESTION 4



**QUESTION 5 (a)**





**QUESTION 5 (b)**



# QUESTION 7

