

B.Tech 2nd Semester Exam, 2021

ENGINEERING GRAPHICS DESIGN

Time : 3 Hours

Full Marks : 70

Instructions:

- (i) The marks are indicated in the right-hand margin.
 - (ii) There are **NINE** questions in this paper.
 - (iii) Attempt **FIVE** questions in all.
 - (iv) Question No. **1** is compulsory.

1. Choose the correct answer of the following (any seven) : $2 \times 7 = 14$

- (a) French curves are used for drawing

 - (i) straight lines
 - (ii) perpendicular lines
 - (iii) spline curves
 - (iv) None of the above

(b) Long-dashed dotted narrow lines are used to show

 - (i) centrelines
 - (ii) main drawings
 - (iii) hidden edges
 - (iv) None of the above

(c) Which one is the reducing scale?

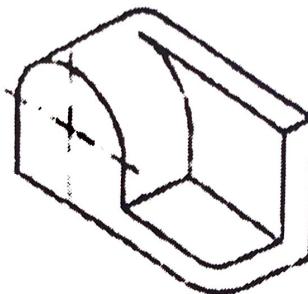
 - (i) 1:1
 - (ii) 1:2
 - (iii) 2:1
 - (iv) None of the above

(d) When a line is inclined to both the planes, HP and VP, the true length of the line is seen in

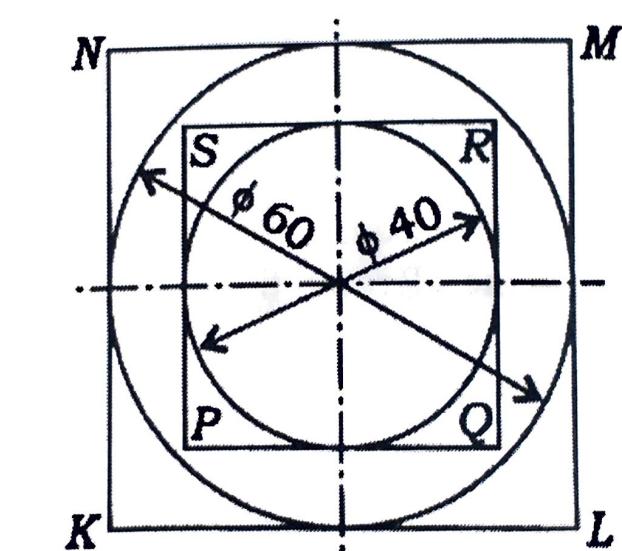
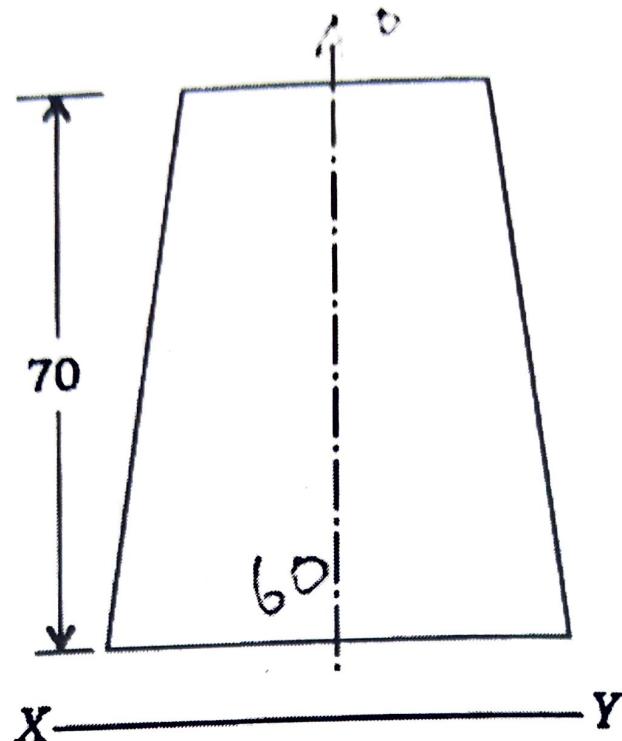
 - (i) front view
 - (ii) top view
 - (iii) left-side view
 - (iv) None of the above

- (e) The eccentricity of an ellipse is
- (i) equal to 1
 - (ii) less than 1
 - (iii) greater than 1
 - (iv) None of the above
- (f) Section plane can be
- (i) perpendicular to HP
 - (ii) perpendicular to VP
 - (iii) inclined to both HP and VP
 - (iv) All of the above
- (g) Isometric projection
- (i) is larger than the object
 - (ii) is equal to the object
 - (iii) is smaller than the object
 - (iv) can be either larger or smaller
- (h) The major functions to be performed by a computer-aided drafting system are
- (i) basic set-up of a drawing
 - (ii) drawing the objects
 - (iii) changing the object properties
 - (iv) All of the above
- (i) Which function toggles between ORTHO modes?
- (i) F8
 - (ii) F2
 - (iii) F9
 - (iv) F3
- (j) TTT command is used for drawing
- (i) line
 - (ii) circle
 - (iii) arc
 - (iv) ellipse

2. The major axis of an ellipse is 150 mm long and the minor axis is 100 mm long. Find the foci and draw the ellipse by arcs of circles' method. Draw a tangent to the ellipse at a point on it 25 mm above the major axis. 14
3. A coin of 35 mm diameter rolls over dining table without slipping. A point on the circumference of the coin is in contact with the table surface in the beginning and after one complete revolution. Draw the curve traced by the point. Draw a tangent and a normal at any point on the curve. 14
4. Draw the elevation and plan in first angle projection of the given object as shown in figure below : 14



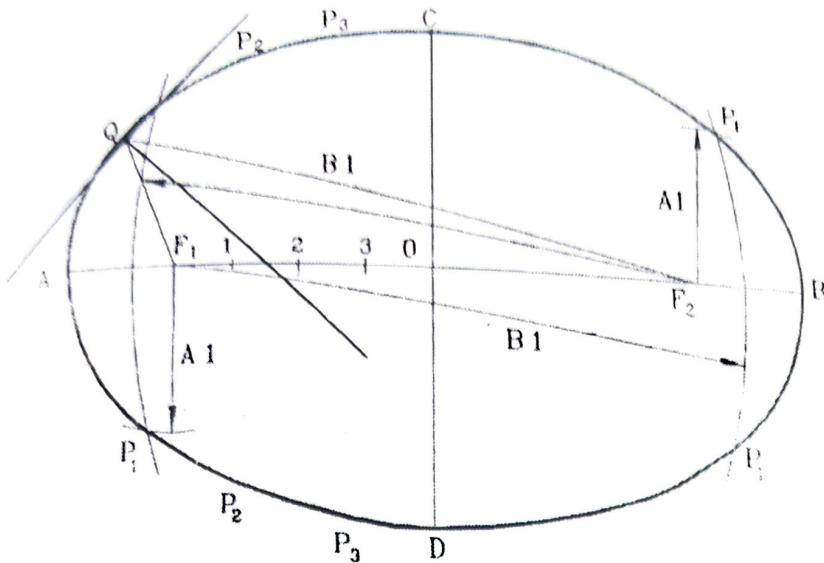
5. A line AB is in the first quadrant. Its ends A and b are 20 mm and 60 mm in front of the VP respectively. The distance between the end projection is 75mm. The line is inclined at 30° to the HP and its horizontal trace is 10 mm above XY. Draw the projection of AB and determine its true length. 14
6. Draw the projection of a pentagonal pyramid base 30 mm edge and axis 50 mm long, having its base on the HP and an edge of the base parallel to the VP. 14
7. Draw the projections of a cone, base 50 mm diameter and axis 75 mm long, lying on a generator on the ground with the top view of the axis making an angle of 45° with VP. 14
8. A square prism, base 40 mm side, axis 80 mm long, has its base on the HP and its faces equally inclined to the VP. It is cut by a plane, perpendicular to the VP, inclined at 60° to the HP and passing through a point on the axis, 55 mm above the HP. Draw its front view, sectional top view and another top view on an AIP parallel to the section plane. 14
9. Projection of the frustum of the cones is shown in figure below. Draw its isometric view : 14



Answer

1. (a) (iv)
- (b) (i)
- (c) (iii)
- (d) (iv)
- (e) (i)
- (f) (iv)
- (g) (iii)
- (h) (iv)
- (i) (i)
- (j) (ii)

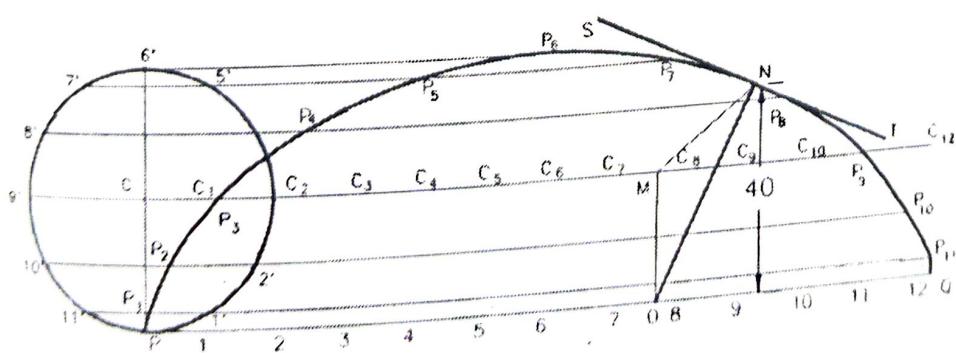
2.



Step :

- (1) Draw AB of 150mm long and from centre O draw CD perpendicular to AB of 100 mm length so that O is also center of CD.
- (2) Take AO in compass and with C as center cut major axis AB in F1 & F2.
- (3) Mark points 1, 2, 3 on AO and with F1 as center and radius A-1 draw arc and cut this arc by another arc with F2 as center and radius B-1. Similarly with F1 as centre and radius A-2 draw an arc and cut this arc by another arc of radius B-2 and centre F2, and so on. Join P1, P2, P3 by smooth curve.
- (4) Mark Q 25 mm above major axis. Join Q to F1 & F2. Bisect the angle F'QF2. This angle bisector is normal to ellipse and perpendicular to it is tangent to ellipse.

3.



Step (1) Draw a circle 35 mm diameter with centre C.

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Draw a line tangent to the circle of length pD.

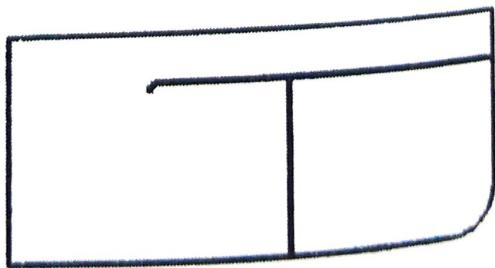
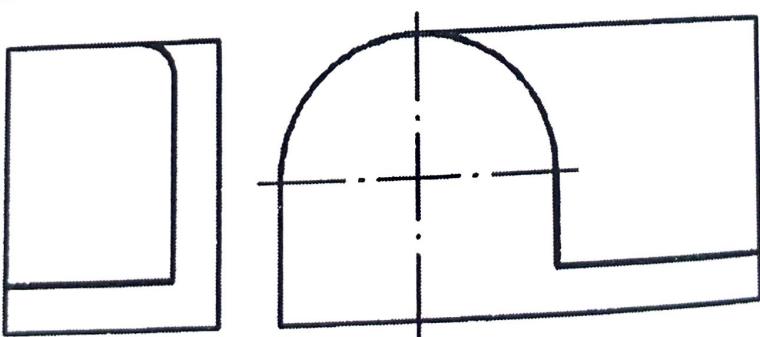
(2) Divide circle and length pD (equal to length PQ) into 12 equal parts.

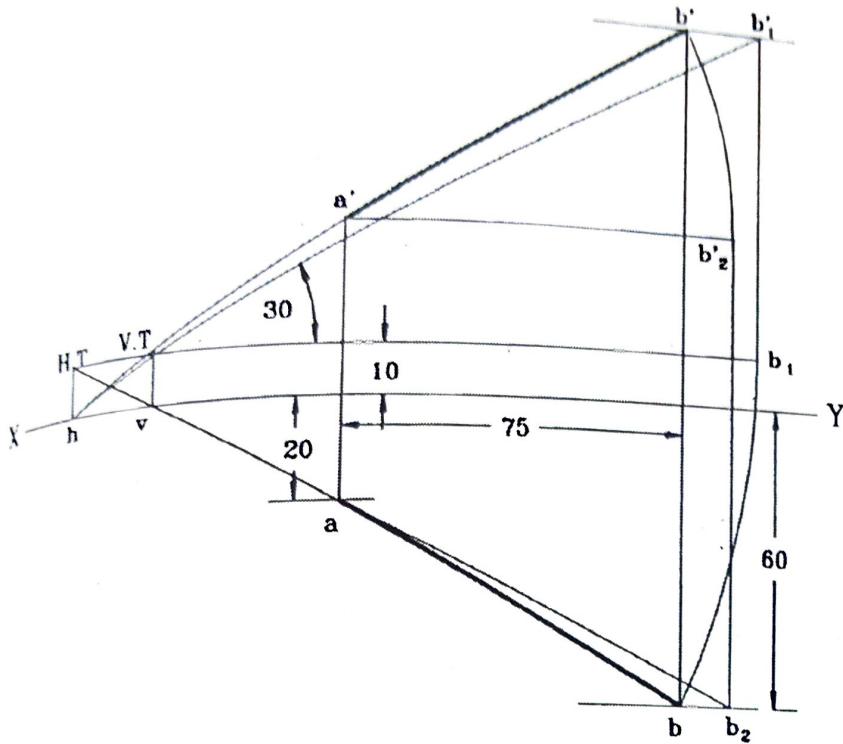
(3) Draw parallel lines to PQ from all divisions of circle. Erect perpendiculars to line PQ from its divisions (i.e. 1, 2, 3,) so that they meet centre line and number these divisions as C₁, C₂, C₃.....C₁₂.

(4) With centre C₁ and radius 25 mm in compass cut an arc on parallel line from point '1' on left side of C₁ to obtain P₁. With centre C₂ and radius 25 mm in compass cut an arc on parallel line from point 2' on left side of C₂ to obtain P₂. Similarly locate point P₃, P₄, P₅, P₆ will be just above C₆ and later on the points P₁, P₂, P₃ P₁₂. The curve is cycloid.

(5) Locate a point N on the cycloid 40 mm from line PQ. From N cut an arc on the centre line with radius 25 mm, intersecting at point M. Drop a perpendicular from M on the line PQ meeting at O. Join O with N. ON is normal to curve. Draw a line passing through N and perpendicular to ON. This line ST is tangent to curve.

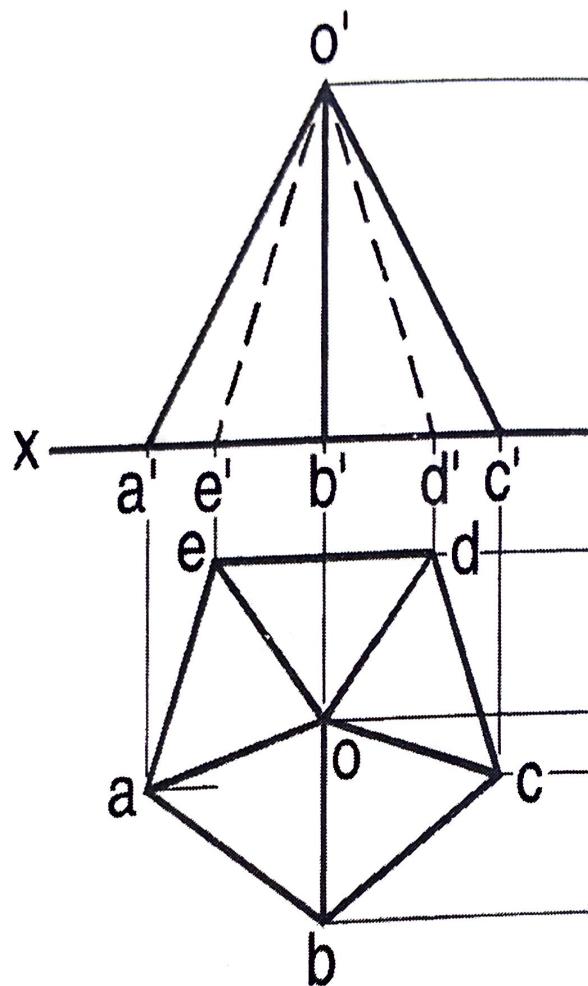
4.





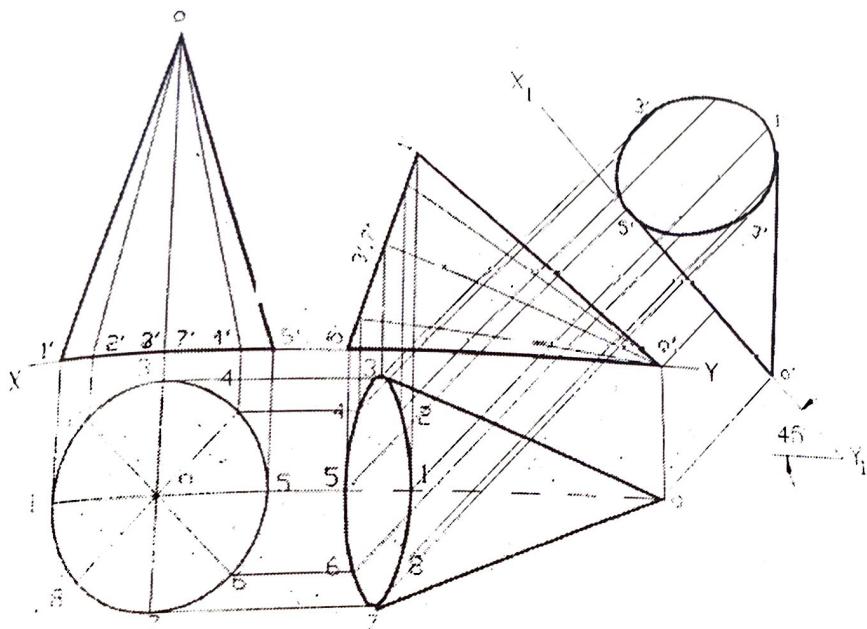
Step

- (1) Mark a 20 mm below xy. Measure 75 mm xy from a and mark b 60 mm below xy. Extend ba to get H.T. 10 mm above xy. Locate h.
- (2) Rotate H.T. b to H.T. b1. Draw projector from b1. At h make an angle of 30° and locate b1' on the projector drawn from b1.
- (3) Draw locus of b' through b1'. Project b to obtain b'. Join b'h. Locate ofline AB.
- (4) Rotate a'b to a'b2'. Project b2' to get b2. Join ab2. This is true length ofline AB.
- (5) Mark v as shown. Locate V.T., on extended a'b' as shown.



- (1) Assume the side DE which is never the V.P., to be parallel to the V.P. as shown in the pictorial view.
- (2) In the top view, draw a regular pentagon abcde with ed parallel to and nearer xy. Locate its centre O and join it with the corners to indicate the slant edges.
- (3) Through O, project the axis in the front view and mark the apex o' , 50 mm above xy. Project all the corners of the base on xy. Draw lines $o'a'$, $o'b'$ and $o'c'$ to show the visible edges. Show $o'd'$ and $o'e'$ for the hidden edges as dashed lines.

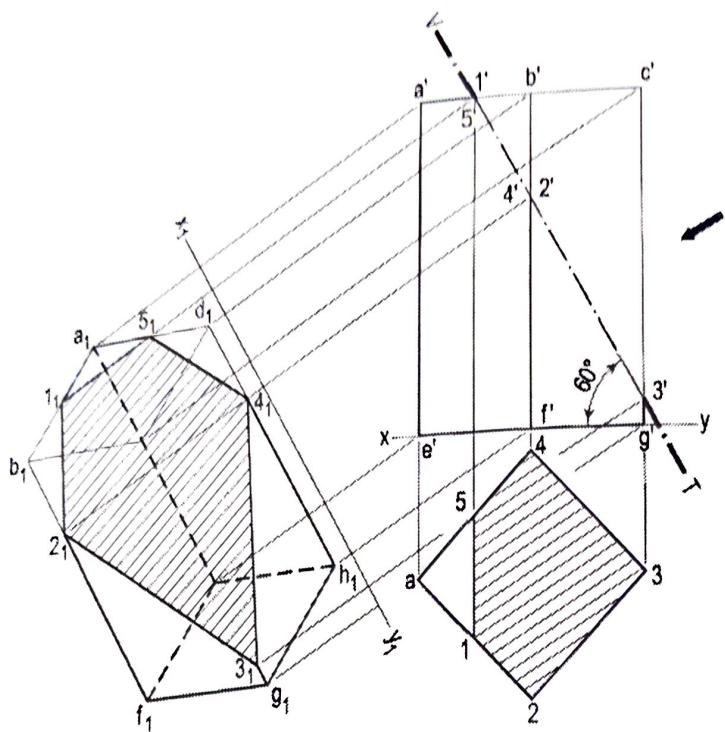
7.



Step

- Draw in top view a circle of diameter 50 mm. Project front view.
- Rotate front view such that one of the generator is in H.P. Project Top View
- Draw $X_1 Y_1$ inclined at 45° to xy and project a top view to obtain the required front view.

8.

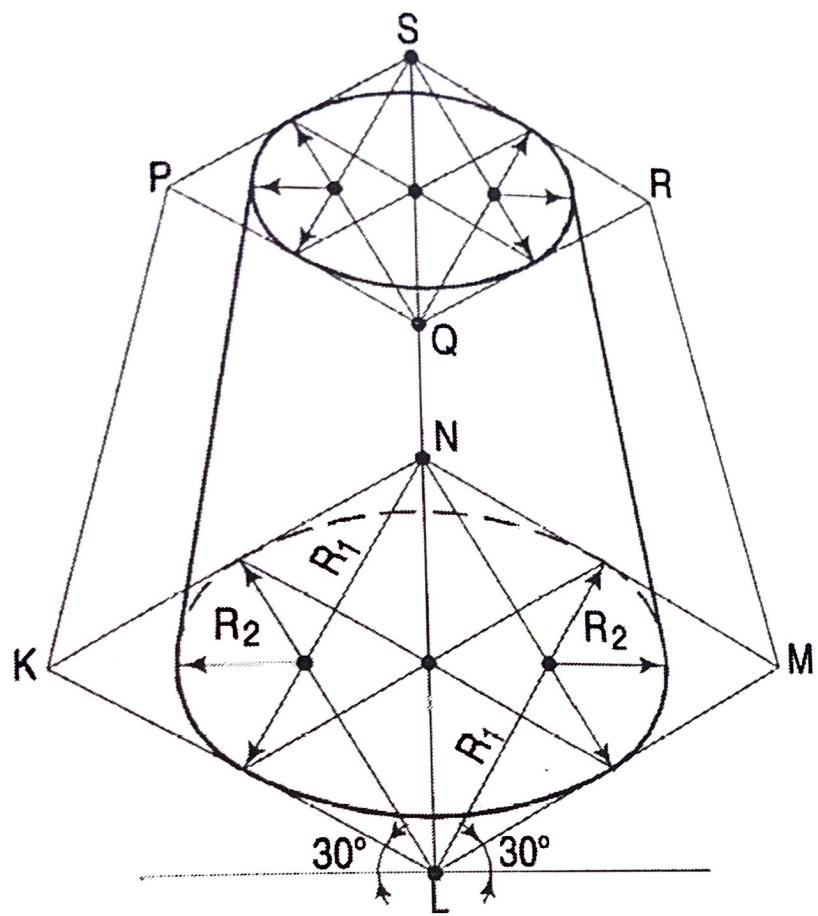


The section will be seen as a line in the front view.

- (i) Draw a line V.T. in the front view inclined at 45° to XY and passing through the top end of the axis. It cuts four edges, viz. a', c at 1', e', b' at 2', c'd' at 3' and d'h' at 4'.
- (ii) Project the top view of the section, viz the figure 1, 2, 3, 4. It does not show the true shape of the section, as the section plane is inclined to the H.P. to determine the true shape, an auxiliary top view of the section should be projectd on an A.I.P. parallel to the section plane.
- (iii) Assuming the new reference line for the A.I.P. to coincide with the V.T., project the true shape of the section as shown by quadrilateral $1_1, 2_1, 3_1, 4_1$.
The distances of all the points from the V.T. should be taken equal to their corresponding distances from XY in the top view, e.g. $1_1 1' = e' 1$, $4_1 4' = h' 4$ etc.
- (iv) To project an auxillary sectional top view of the cube, draw a new reference line $x_1 y_1$, parallel to the V.T.. The whole cube may first be projected and the points for the section may then be projected on the corresponding lines for the edges. Join these points in correct sequence and obtain the required top view.
- (v) Draw section lines in the cut-surface, in the views where it is seen.

Keep the line for the removed edges thin and fainter.

9.



(2019) Engineering Graphics and Design - 100202 • 1

B.Tech 2nd Semester Exam, 2019 (New)

Engineering Graphics and Design – 100202

Time : 3 Hours

Full Marks : 70

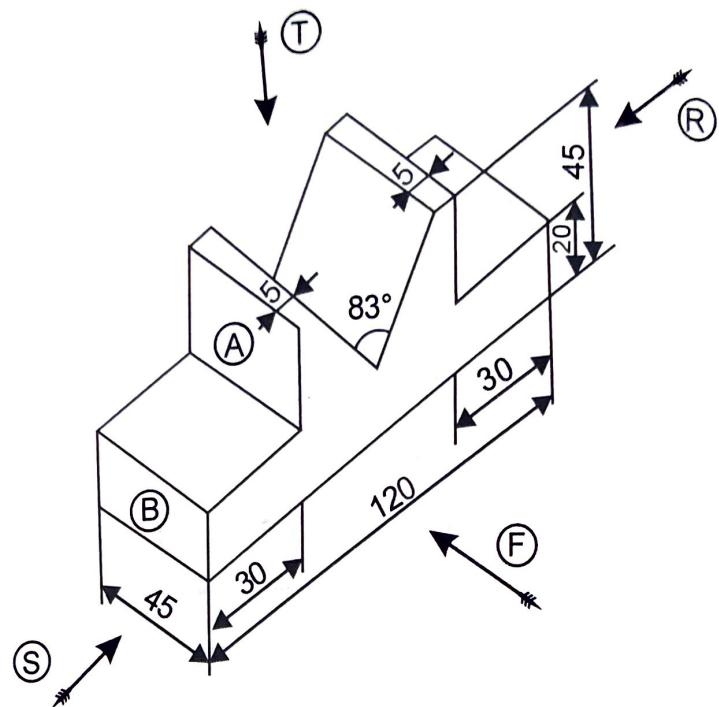
Instructions:

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 - (v) Symbols used (if any) have their usual meanings.
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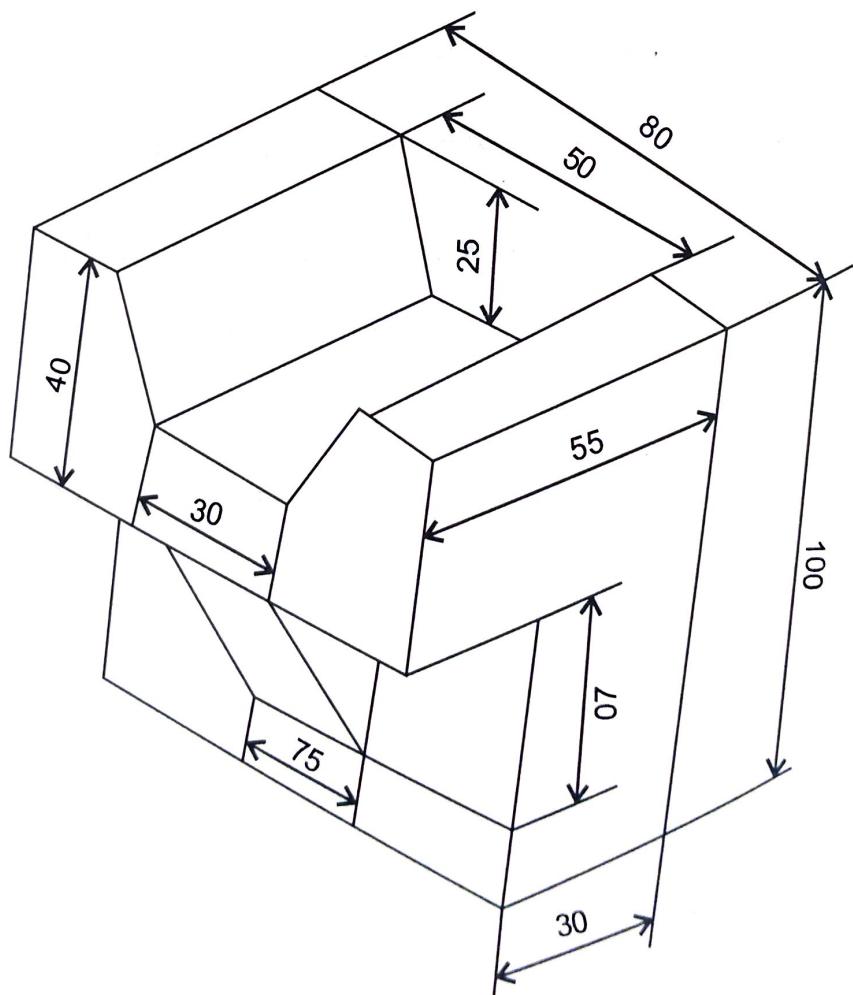
1. Answer any seven question:

- (a) What are the main requirements of lettering?
- (b) What do you mean by normal, compressed and extended lettering?
- (c) What are guidelines and why are they necessary in lettering?
- (d) Define engineering drawing. Why is drawing called the universal language of engineers?
- (e) How will you test the T-square?
- (f) What is the difference between a quadrilateral and a polygon?
- (g) What is the difference between a median and an altitude?
- (h) What are the general rules of dimensioning?
- (i) What are the standard sizes of drawing sheet according to ISI?
- (j) What are the standard sizes of drawing sheet according to ISI?

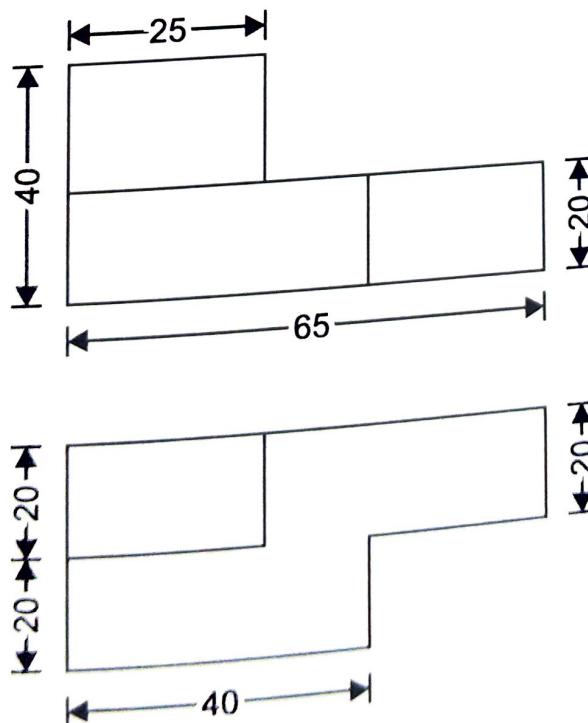
2. Draw the front view, top view, side view and bottom view of a given object by third angle projection method:



3. Draw the elevation, plan, right-end view and left-end view of a given block by following first angle projection:



4. A hexagonal pyramid, side base 25 mm and axis 50 mm long, is resting on an edge of its base on HP with its axis inclined at 30° to HP and parallel to VP. Draw its projections.
5. Develop the lateral surface of an oblique cone, the base being elliptical, its major and minor axes are 30 mm and 20 mm and its height is 40 mm. The axis of the cone is making an angle of 45° with the horizontal.
6. A cylinder of 25 mm diameter and 45 mm long is resting on its circular rim with its axis inclined at 45° to the VP and parallel to the HP. Draw the projections.
7. Draw the projection of a pentagonal pyramid, base 25 mm edge and axis 45 mm long, is resting on HP with one of its base edges inclined at an angle of 30° to the VP.
8. A square prism of 50 edge and 65 mm height stands on one of its faces on the HP with a vertical face making 45° angle with VP. A horizontal hole of 25 mm diameter is drilled centrally through the prism such that the hole passes through the opposite vertical edge of the cube. Draw the development of the surface of the prism and the hole.
9. The following figure shows two orthographic views of an object. Draw the isometric projection of the object:



Answer

1. (a) Writing of titles, dimensions, notes and other important particular on a drawing is called lettering. It is an important part of a drawing. However accurate and neat a drawing may be drawn. Its appearance is spoiled and sometimes, its usefulness is impaired by poor lettering. Lettering should be therefore, be done properly in clear, legible and uniform style. It should be in plain and simple style so that it could be done freehand and speedily.

1. (b) Normal letters are used for main titles and generally written in 6 mm to 8 mm size. Sub-titles in 3 mm to 6 mm, while note and dimension figures etc. in 3 mm to 5 mm size. The ratio of their base to height as follows.

Height of capitals (14/14).

Height of lower-case letters – (10/14).

In case of compressed letters height of letter is compressed with respect to base. The ratio of base to height is as follows.

Height of capitals letters (10/14), height of small-case letters.

In case of extended letters. The height of letter is increased w.r.t. base and the thickness of the letter vary from 1/5 to 1/10 of the height of the letters. It is done for visibility of writing from distance so that the advertisement can be read from distance.

The ratio of height to base is given as follows:

Capital letters – Ratio – (14/6)

Small letters – Ratio – (10/6)

1. (c) Single-stroke letters: The Bureau of Indian standards (IS : 9609–1990) recommend single stroke lettering for use in engineering drawing. These are simplest forms of letters and are usually employed in most of the engineering drawings.

The word single-stroke should not mean that the letter should be made in one stroke without lifting the pencil.

It actually means that the thickness of the line of the letter should be such as to be obtained in one stroke of the pencil. The horizontal lines of letters should be drawn from left to right and vertical or inclined lines from top to bottom.

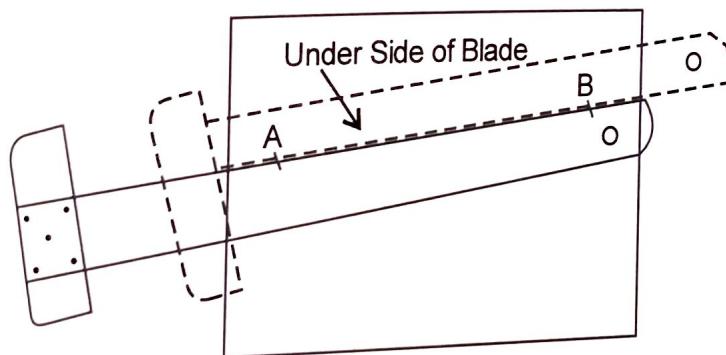
Single stroke letters are of two types

- Vertical and – in this case letters are perpendicular to horizontal.
- Inclined – In this case the slope being 75° with the horizontal.

1. (d) It is a graphic language used for effective communication among engineers. Hence it is called language of engineers.

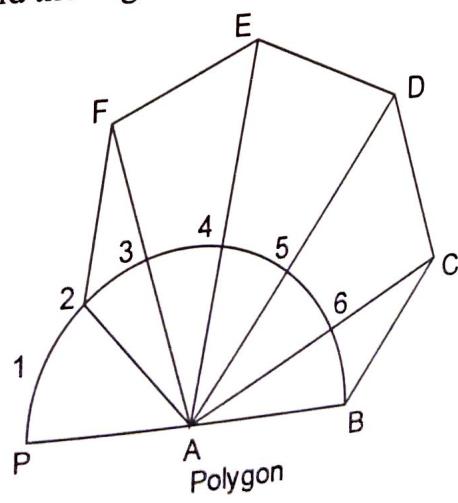
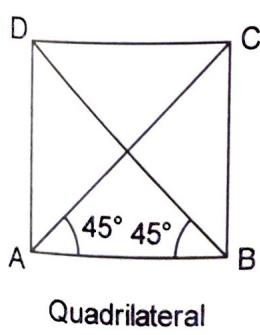
Engineering drawing is widely used in mechanical, production, automobile, aeronautical, chemical, marine and electrical engineering to describe an engineering machine component which has the correct shape and size along with dimensional tolerances for the understanding of the component and production of it in workshop. In civil engineering and architecture, engineering drawing is used to draw the plan and elevation of building. These drawings are used universally for production and constructional work. Hence, it is called universal language for engineers.

1. (e) Testing the straightness of the working edge of the T-square: Mark any two points A and B (Fig. below) spaced wide a part and through them, carefully draw a line with the working edge. Turn the T-square upside down by dashed lines and with the same edge, draw another line passing through the same two points. If the edge is defective the lines will not coincide. The error should be rectified by planing or sand-papering the defective edge.

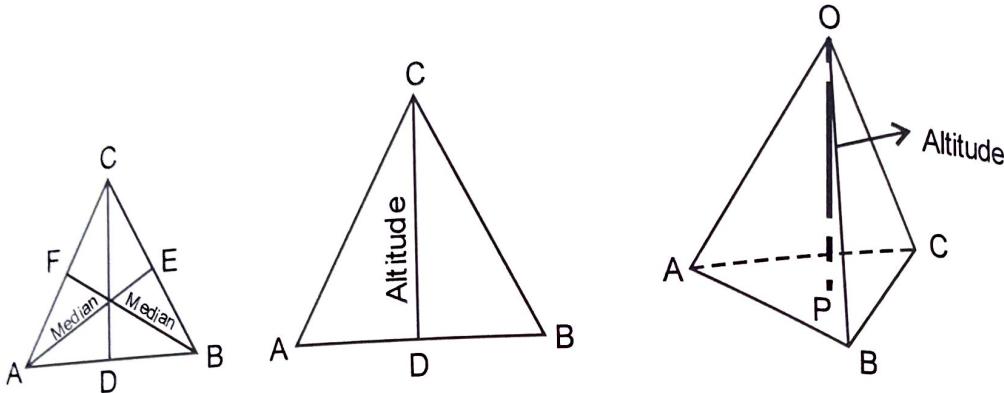


1. (f) A quadrilateral is four sided figure on plan. The angle between two sides is 90° .

Whereas a polygon is a plane figure of five or more than five sides figure. All sides equal and the angle will depend on number of sides.

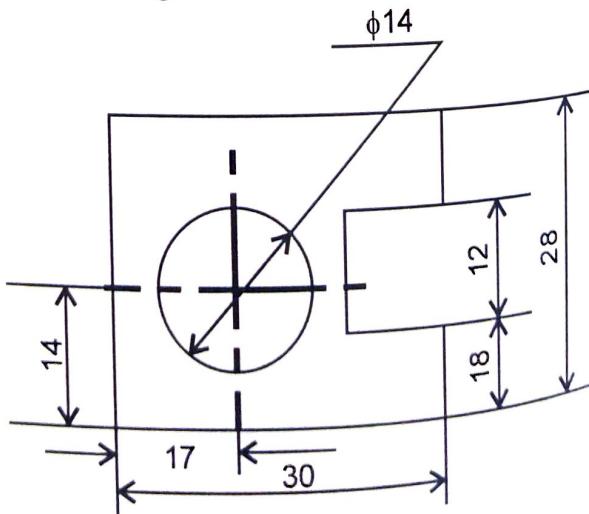


1. (g) A median is the distance from any corner of a triangle to the opposite side middle point. Whereas the altitude is the height of apex from base of the triangle in case of plan figure or from base figure to apex in case of solid figure.



1. (h)
- (i) Dimensioning should be done so completely that further calculation or assumption of any dimension, or direct measurement from drawing is not necessary.
 - (ii) Every dimension must be given, but none should be given more than once.
 - (iii) A dimension should be placed on the view where its use is shown more clearly.
 - (iv) Dimensions should be placed outside the views, unless they are clear and more easily read inside.
 - (v) Mutual crossing of dimension lines and dimensioning between hidden line should be avoided. Dimension lines should not cross any other line of the drawing.
 - (vi) An outline or a centre line should never be used as a dimension line. A centre line may be extended to serve as an extension line.
 - (vii) Aligned system of dimensioning is recommended.

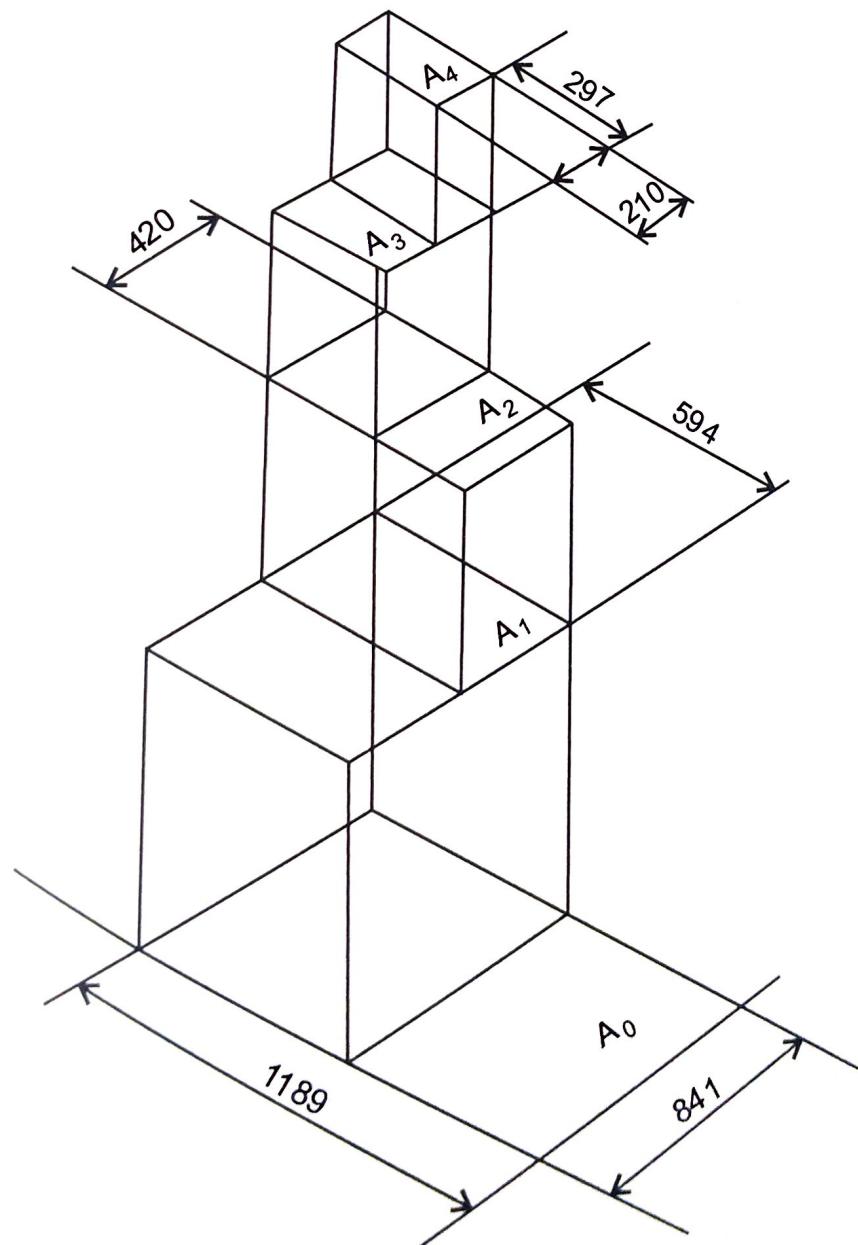
1. (i) **Aligned system:** In the aligned system the dimension is placed perpendicular to the dimension line in such a way that it may be read from the bottom edge or the right-hand edge of the drawing sheet. The dimensions



should be placed near the middle and above, but clear of the dimension lines.

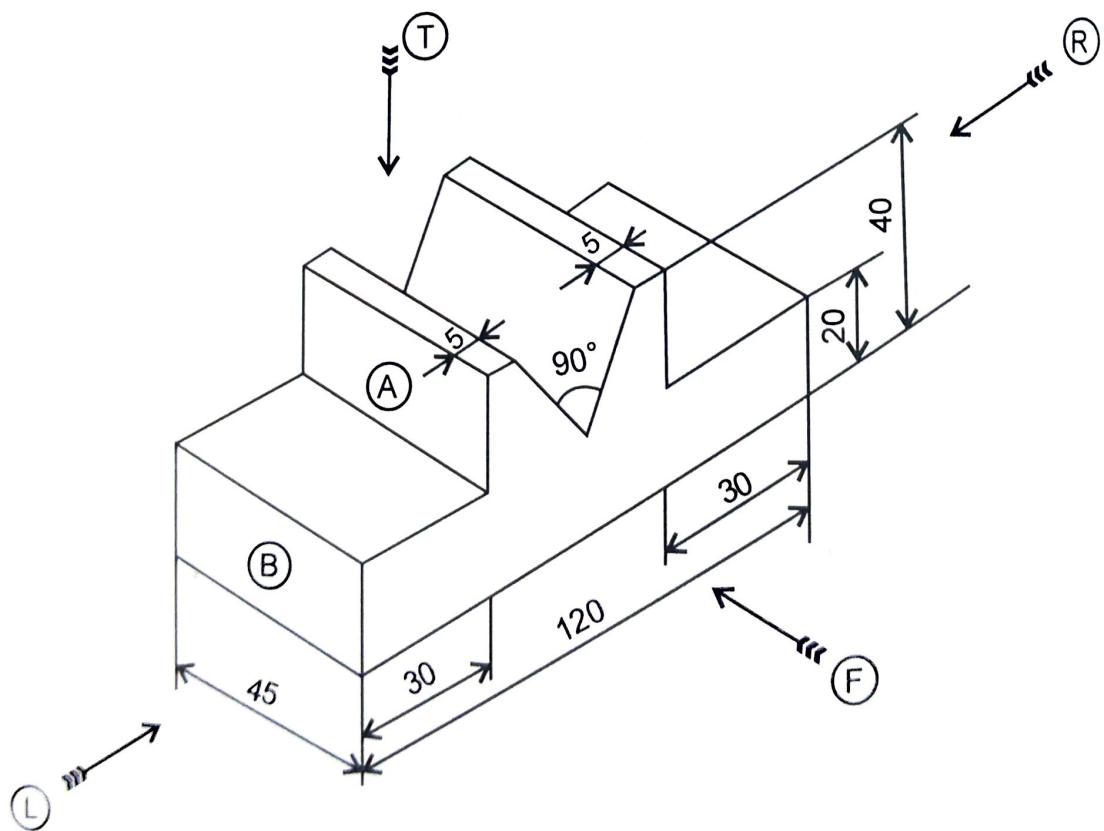
Unilateral system: In unilateral system all dimensions are so placed that they can be read from the bottom edge of the drawing sheet. The dimension lines are broken near the middle for inserting the dimensions. This system is mainly used on large drawings-as of aircrafts, automobiles, etc. Where it is inconvenient to read dimensions from right-hand side.

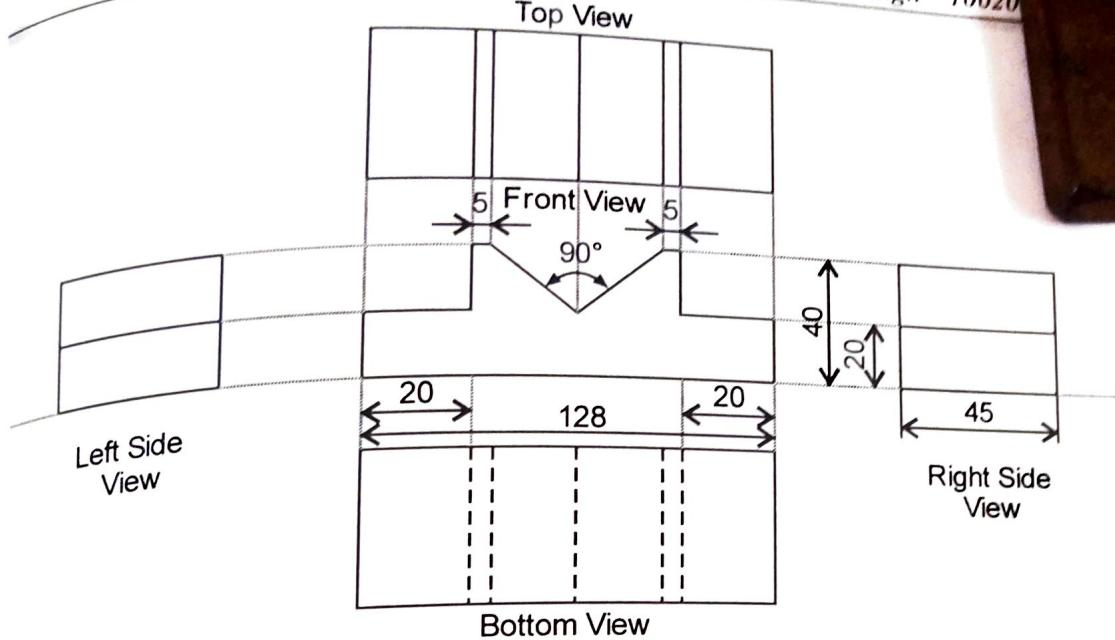
1. (j) The standard sizes of drawing papers recommended by the Bureau of Indian standards (B.I.S) are given in figure below.



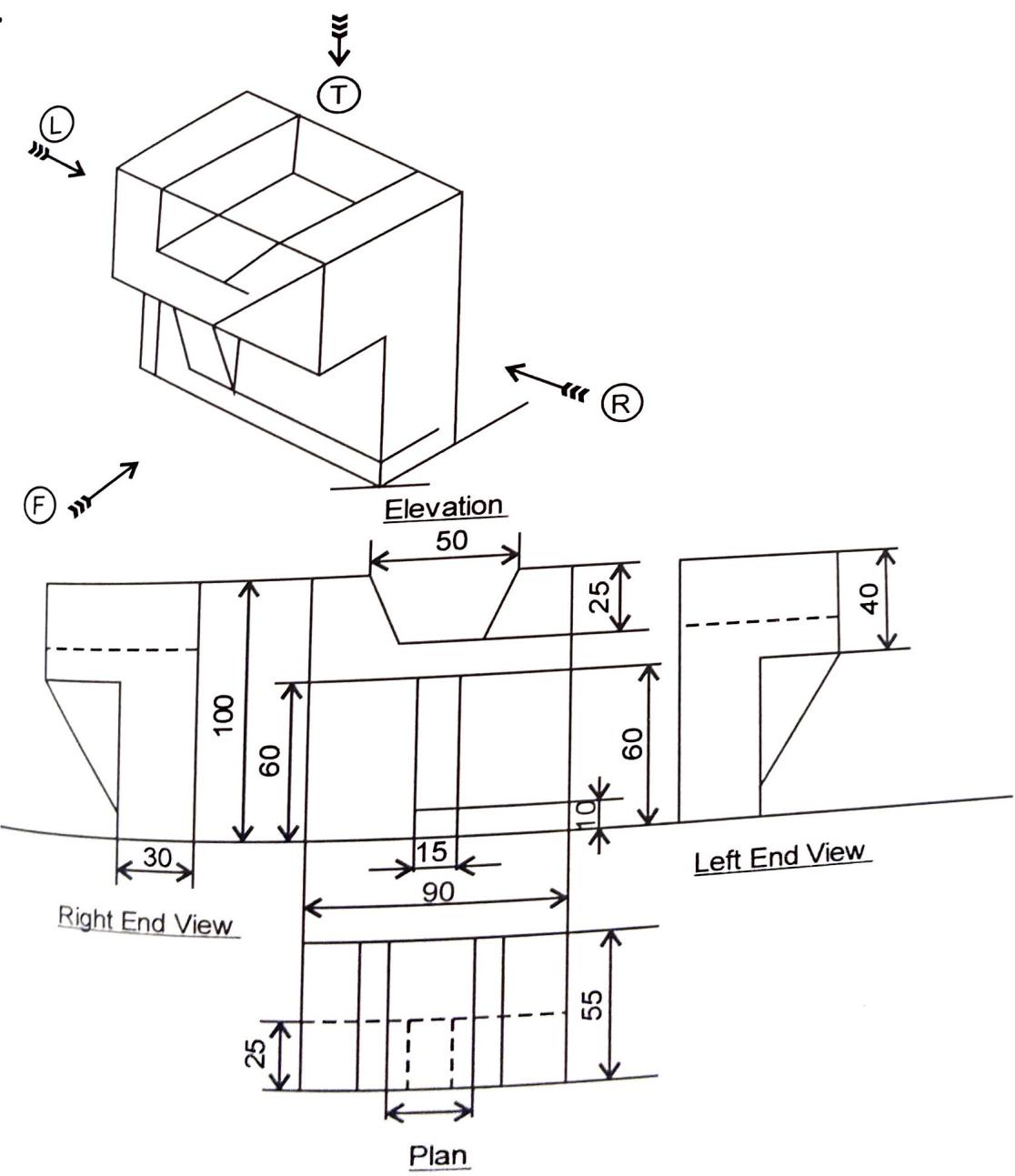
Sheet Designation	Trimmed Size (mm)
A ₀	841 × 1189
A ₁	594 × 841
A ₂	420 × 594
A ₃	297 × 420
A ₄	210 × 297
A ₅	147 × 210

2.

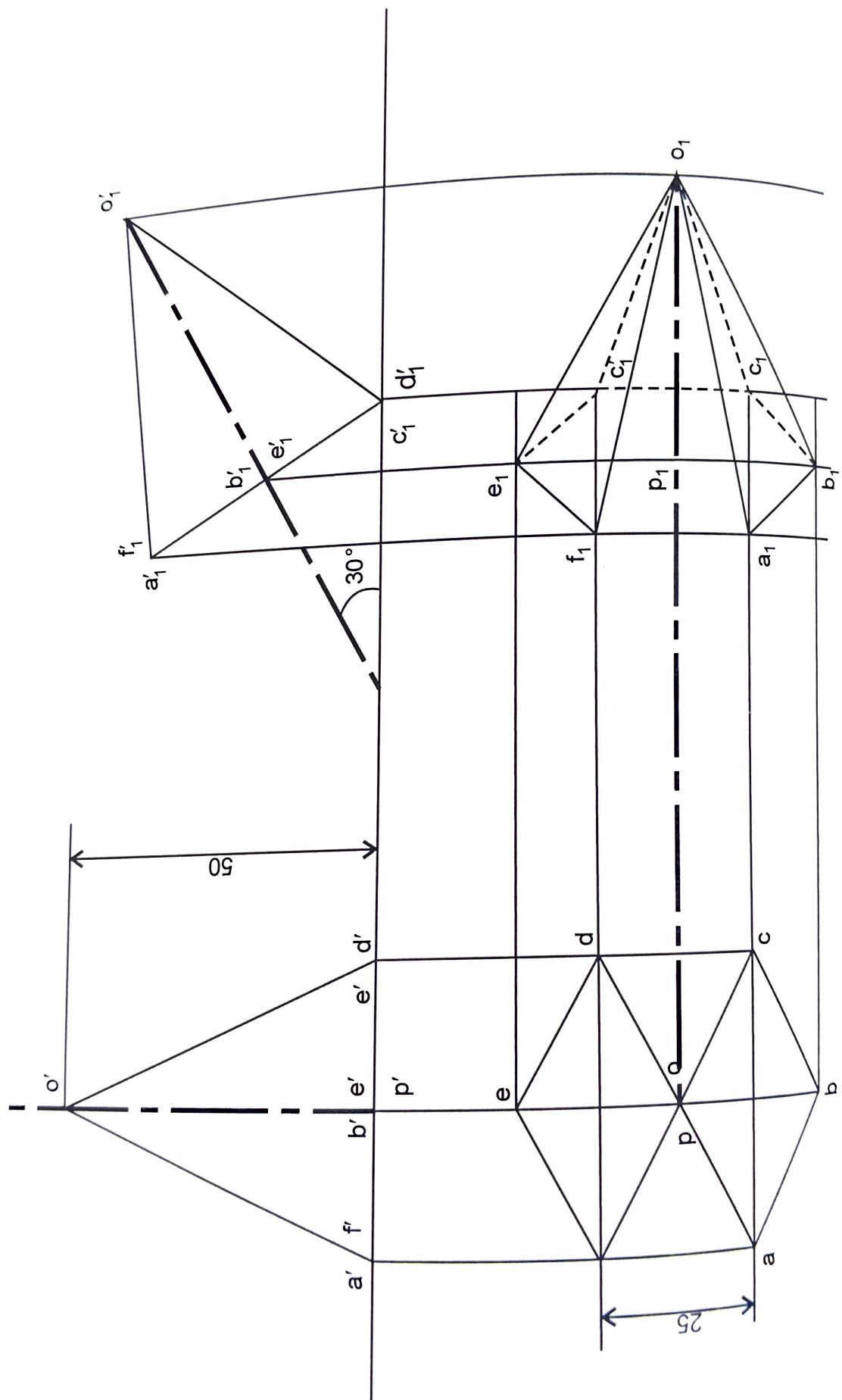




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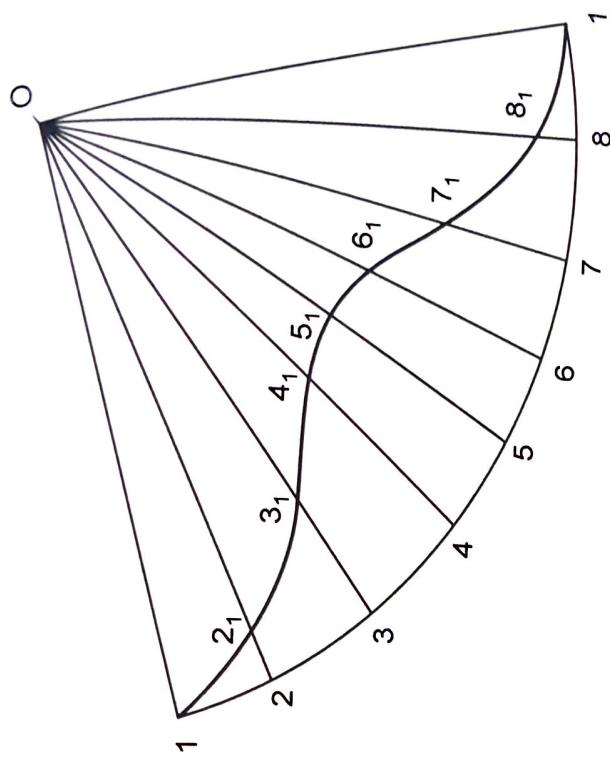


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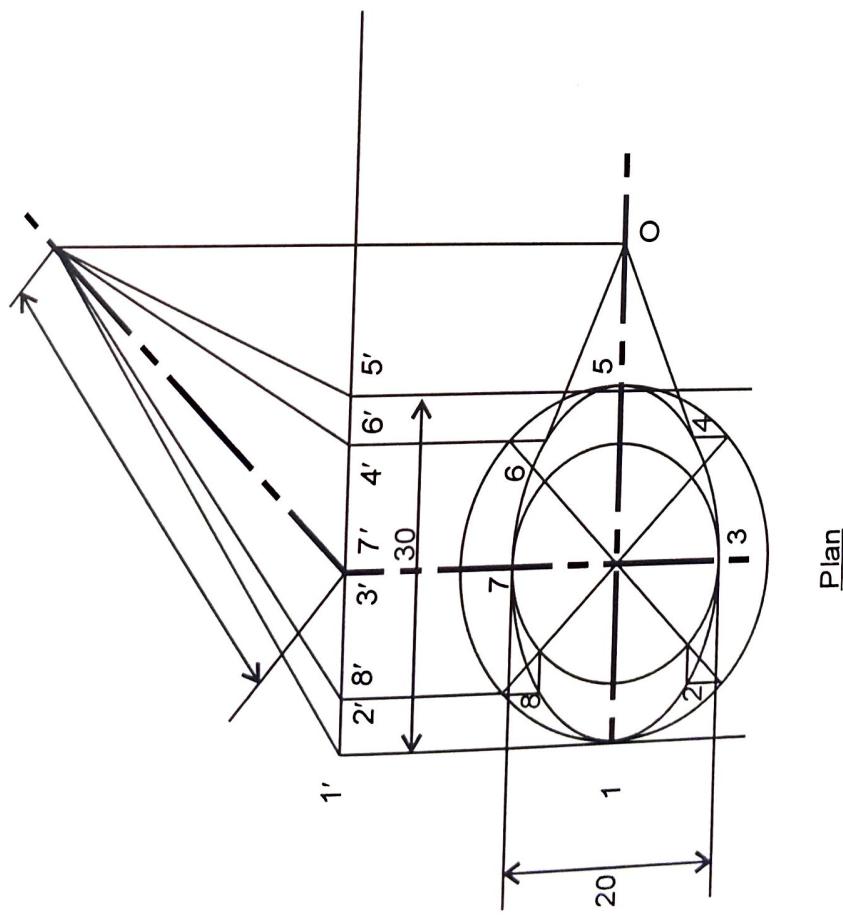
5.

Developed Surface

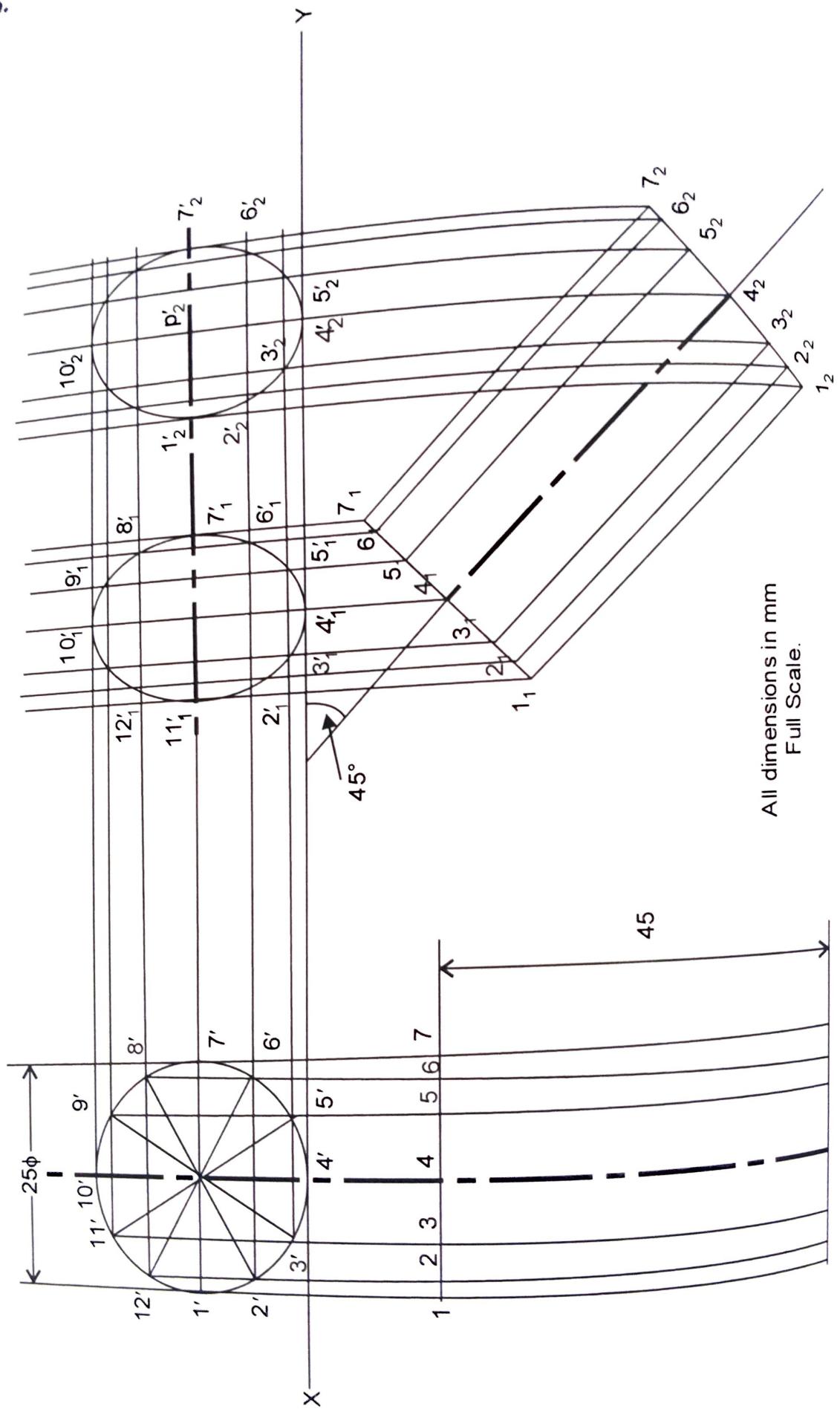


All dimensions in mm
Full Scale

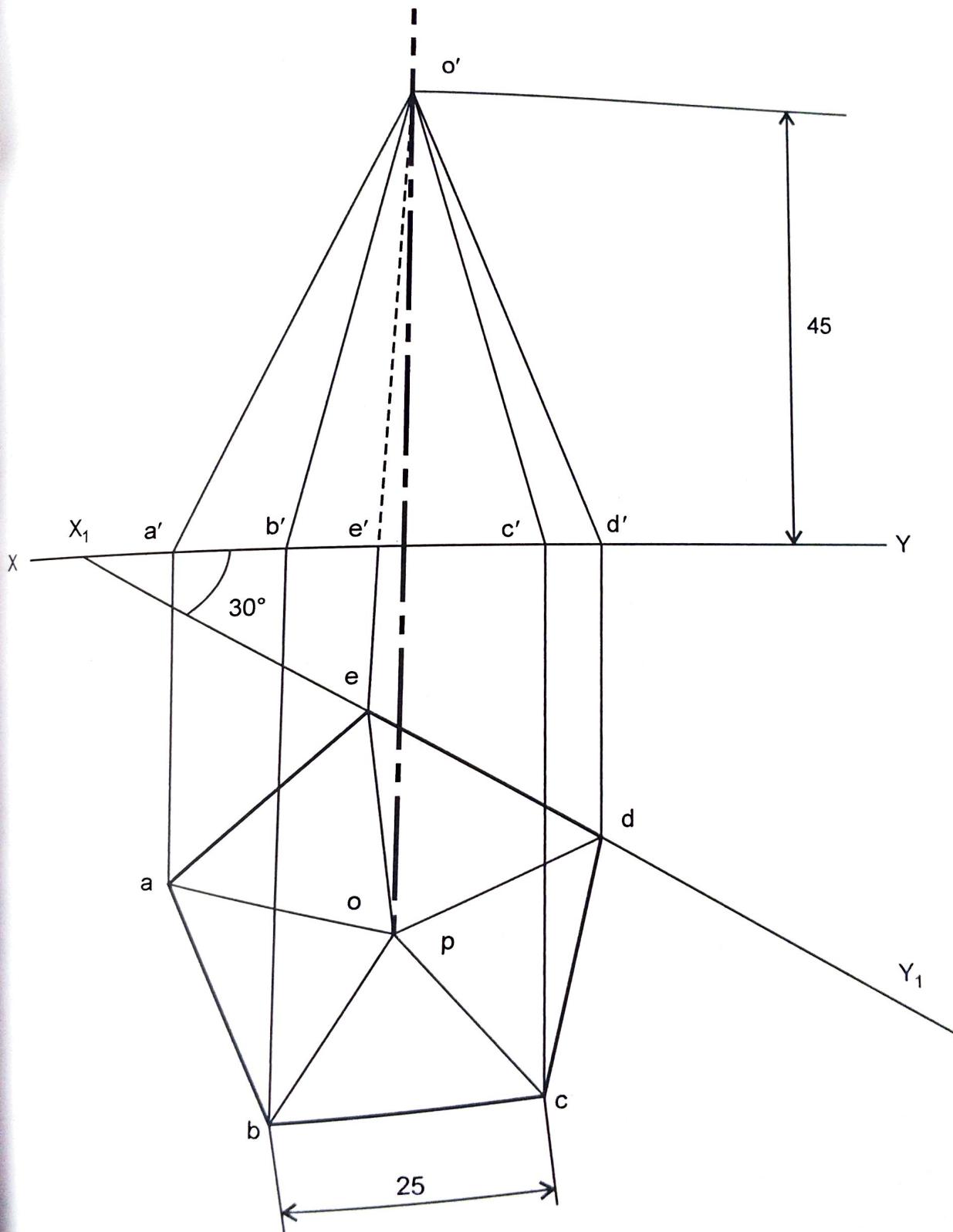
Oblique Cone



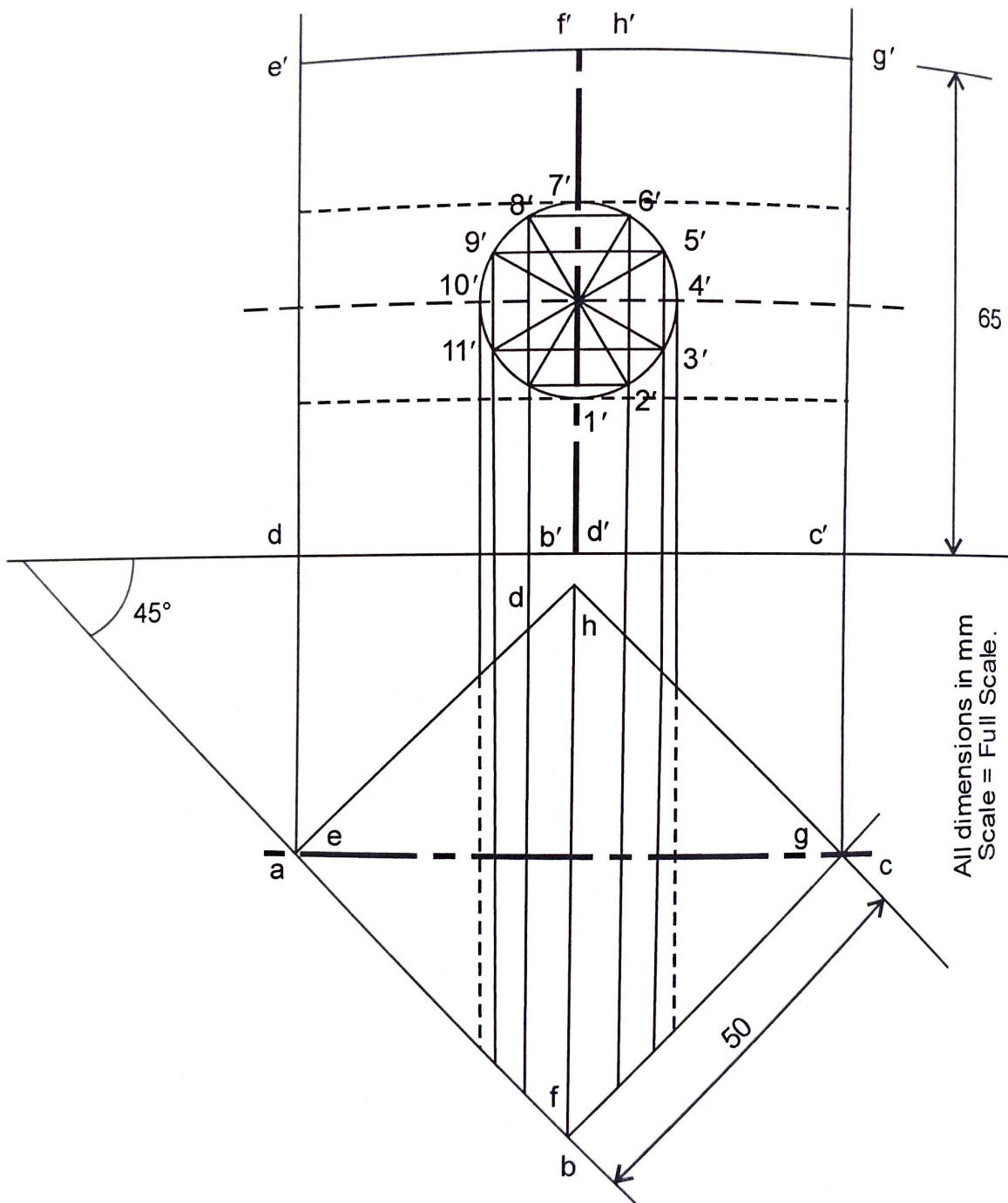
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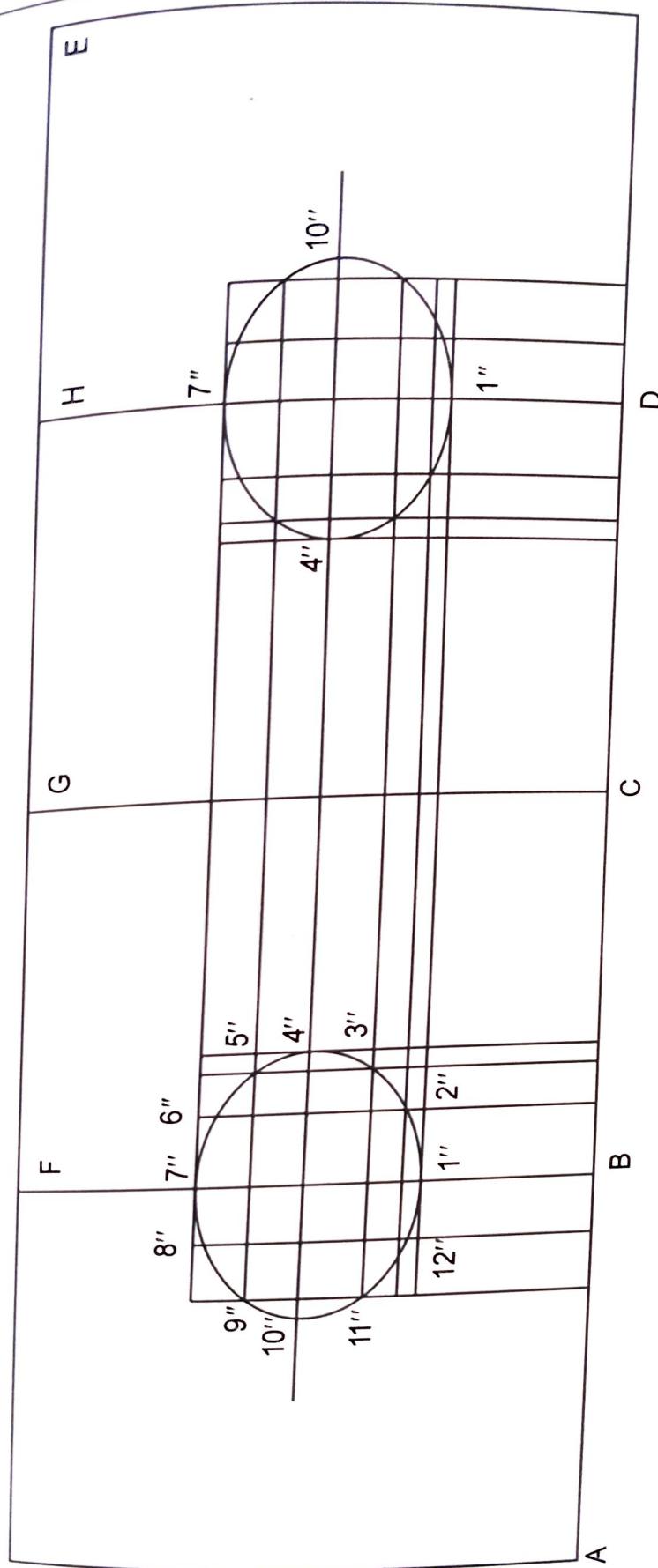


7.



8.

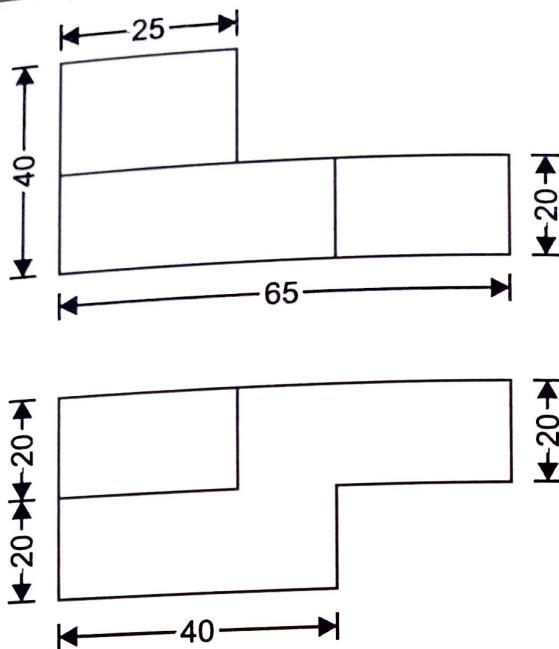




Development of Surface of Prism.



9.



All dimension in mm.
Scale full size.

↙ (T)

Isometric Projection

↖ (F)

