GOVT CO-ED POLYTECHNIC

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LAB MANUAL

Branch : Civil/Electrical Engineering

Year & Semester : 1st Year / 2nd Semester

2000277(037) – Engineering Drawing lab

CONTENTS

Experiment No: 1

Aim: Draw problem related to scales also define/draw lettering dimensions and line

Tools used: Drawing instrument box , Mini drafter, roller scale, drawing sheets, holding clips etc.

Theory of scale: A scale is defined as the ratio of the linear dimensions of element of the object as represented in a drawing to the actual dimensions of the same element of the object itself.

It may not be always possible to prepare full-size drawings. They are, therefore, drawn proportionately smaller or larger.

Types of scale

(1) Plain scales (2) Diagonal scales (3) Comparative scales (4) Vernier scales (5) Scale of chords.

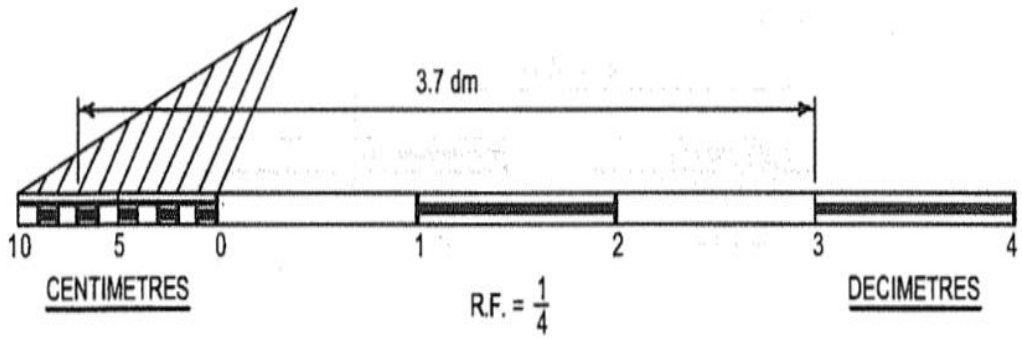
Representative fraction: The ratio of the length of the object represented on drawing to the actual length of the object represented is called the Representative Fraction (i.e. R.F.).

R.F. = Length of the drawing/ Actual length of object

Plain scale

Problem1 Construct a scale of 1 : 4 to show centimetres and long enough to measure upto 5 decimetres.

Sol.



(i)Determine R.F. of the scale. Here it is 1/ 4

(ii) Determine length of the scale

Length of the scale = R.F. x maximum length == 4 x 5 dm == 12.5 cm.

(iii) Draw a line 12.5 cm long and divide it into 5 equal divisions, each representing 1 dm.

(iv) Mark O at the end of the first division and 1, 2, 3 and 4 at the end of each subsequent division to its right.

(v) Divide the first division into 10 equal sub-divisions, each representing 1 cm.
(vi) Mark ems to the left of O as shown in the figure.

Diagonal scale

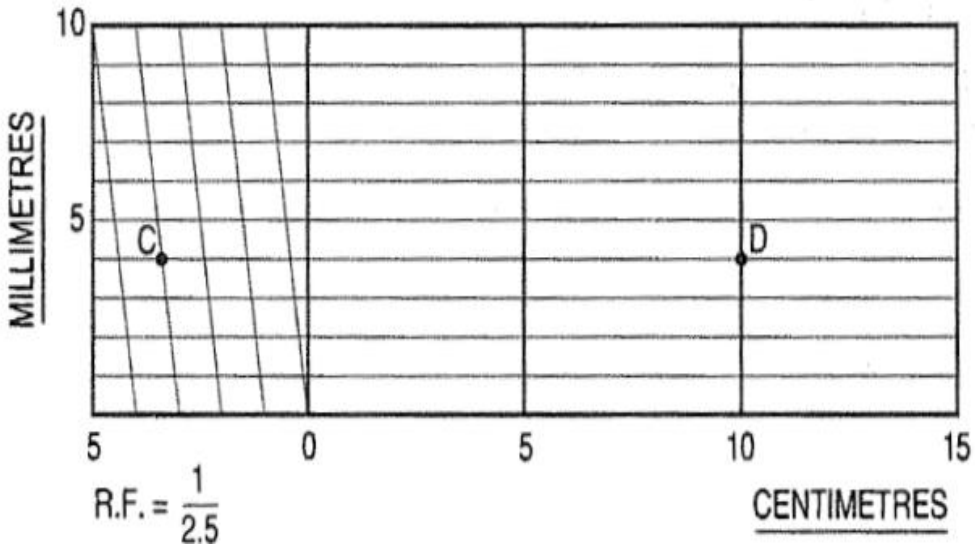
Problem2 Draw a diagonal scale of 1 : 2.5 showing centimetres and millimetres and long enough to measure upto 20 centirnetres

Sol. Length of the scale = (1/2.5)x 20 cm = 8 cm.

(i) Draw a line 8 cm long and divide it into 4 equal parts. Each part will represent a length of 5 cm.

(ii) Divide the first part into 5 equal divisions. Each division will show 1 cm.

(iii) At the left-hand end of the line, draw a vertical line and on it step-off 10 equal divisions of any length**.**



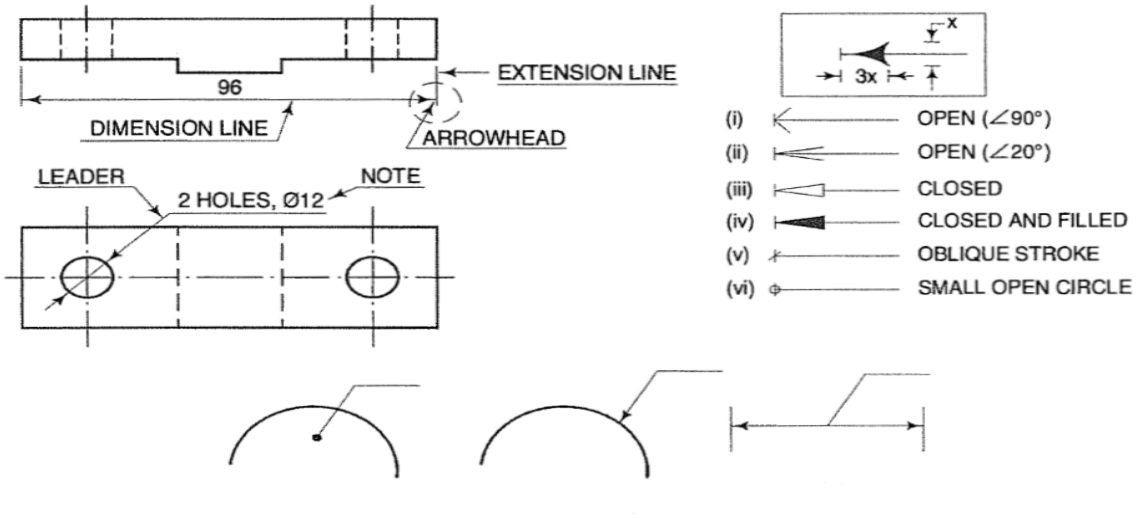
DIMENSIONING

Every drawing, whether a scale drawing or a freehand drawing, besides showing the true shape of an object, must supply its exact length, breadth,

height, sizes and positions of holes, grooves etc. and such other details relating to the manufacture of that object.

Providing this information on a drawing is called dimensioning

Dimensioning term and notation



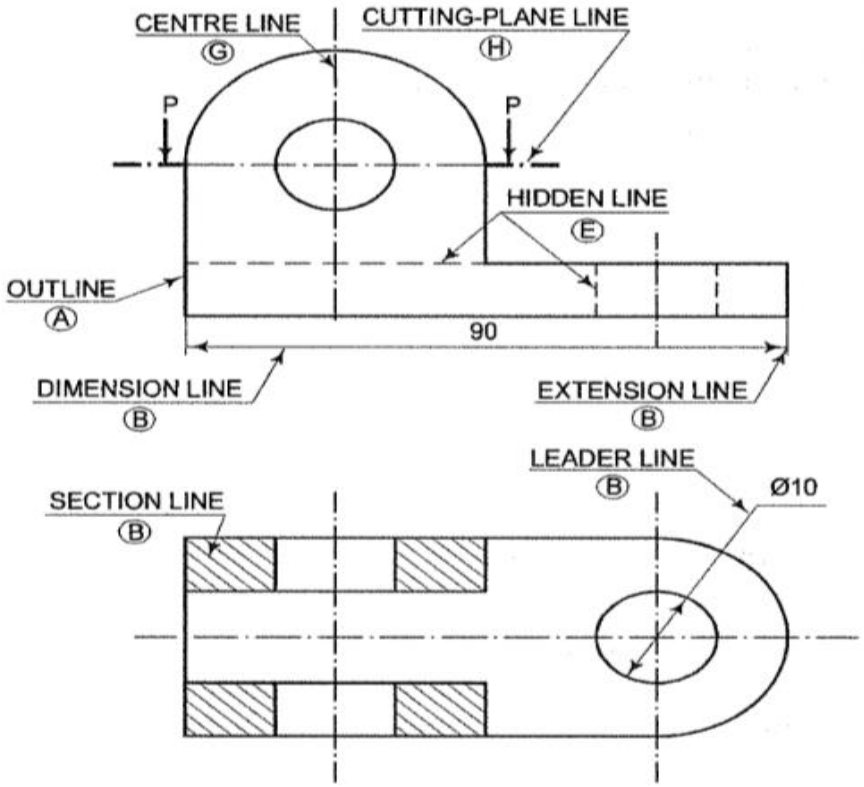
Lines

Various types of lines used in general engineering drawing

	Line	Description	General Application	
A		Continuous thick	A1 A2	Visible outlines. Visible edges.
B		Continuous thin (straight or curved)	B1 B2 B3 B4 B5 B6 B7	Imaginary lines of intersection. Dimension lines. Projection lines. Leader lines. Hatching lines. Outlines of revolved sections in place. Short centre lines
C		Continuous thin free hand	C1	Limits of partial or interrupted views and sections, If the limit is not a chain thin.
D		Continuous thin (straight) with zigzags	D1	Long break line
E		Dashed thick	E1 E2	Hidden outlines. Hidden edges.
F		Dashed thin	F1 F2	Hidden outlines. Hidden edges.
G		Chain thin	G1 G2 G3	Center lines. Lines of symmetry. Trajectories
H		Chain thin, thick at ends and changes of direction	H1	Cutting planes.
J		Chain thick	J1	Indication of lines or surfaces to which a special requirement applies
K		Chain thin double dashed	K1 K1 K3 K4 K5	Outlines of adjacent parts. Alternative or extreme position of movable parts. Centroidal lines. Initial outlines prior to forming Parts situated in front of the cutting plane

Problem3 : Draw an object and show the different types of lines used in it.

Sol



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Lettering

Lettering is generally done in capital letters. Different sizes of letters are used for different purposes. The main titles are generally written in 6 mm to 8 mm size, sub-titles in 3 mm to 6 mm size, while notes, dimension figures etc. in 3 mm to 5 mm size. The drawing number in the title block is written in numerals of 10 mm to 12 mm size.

EXERCISE1

Q1 The area of a field is 50,000 sq m. The length and the breadth of the field, on the map is 10 cm and 8 cm respectively. Construct a diagonal scale which can read upto one metre. Mark the length of 235 metre on the scale. What is the R.F. of the scale?

Q2 Draw a scale of 1 : 60 to show metres and decimetres and long enough to measure upto 6 metres.

Q3 write "ENGINEERING DRAWING" using single stroke having height 15mm and width 10mm.

Q4 Draw an object and show the different types of lines used in it

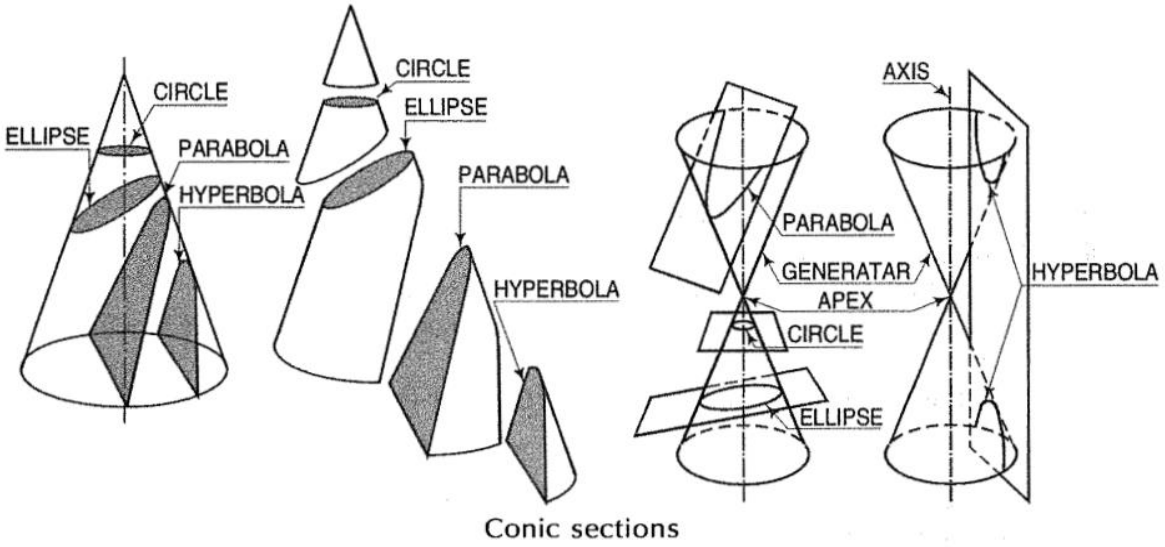
Experiment No: 2

Aim: Draw parabola, Ellipse and hyperbola by using different special methods

Tools used: Drawing instrument box , Mini drafter, roller scale, drawing sheets, holding clips etc.

Theory of Conic section: Sections obtained by intersection of right circular cone by a plane in different position relative to the axis of cone are called conic section.

Eg. Parabola, ellipse, hyperbola



Conic sections

a) When the section plane is inclined to the axis and cuts all the generators on one side of the apex, the section is an ellipse.

bi) When the section plane is inclined to the axis and is parallel to one of the generators, the section is a parabola.

c) A hyperbola is a plane curve having two separate parts or branches, formed when two cones that point towards one another are intersected by a plane that is parallel to the axes of the cones.

EXERCISE2

Q1 To construct an ellipse when the distance of the focus from the directrix is equal to 50 mm and eccentricity is 2/3.(using concentric and oblong method)

Q2 To construct a parabola, when the distance of the Focus from the directrix is 50 mm.

Q3 To construct a parabola, when having base is 80 mm and height is 50 mm.(rectangle, tangent method)

Experiment No: 3

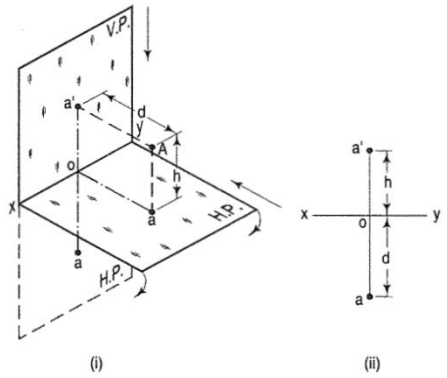
Aim: Draw the problems on projection of points and lines on a drawing sheet

Tools used: Drawing instrument box , Mini drafter, roller scale, drawing sheets, holding clips etc.

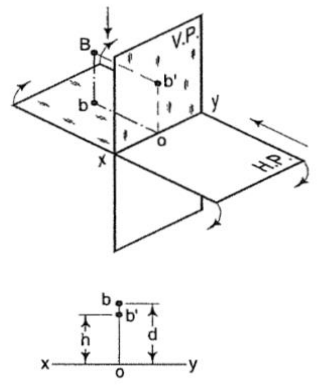
Theory of point: a point is a location represented by a dot. A point does not have any length, width, shape or size, it only has a position.

Projection of point : to draw front view and top view of point is called projection of point.

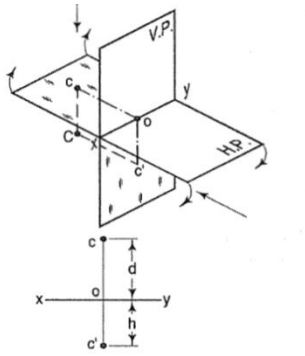
S no	Statement/position of point	Front view	Top view
1	Point lies above the HP & in front of VP-1st quadrant	Above the xy line	Below the xy line
2	Point lies above the HP & behind of VP- 2nd quadrant	Above the xy line	Above the xy line
3	Point lies below the HP & behind of VP- 3rd quadrant	Below the xy line	Above the xy line
4	Point lies below the HP & infront of VP- 4th quadrant	Below the xy line	Below the xy line



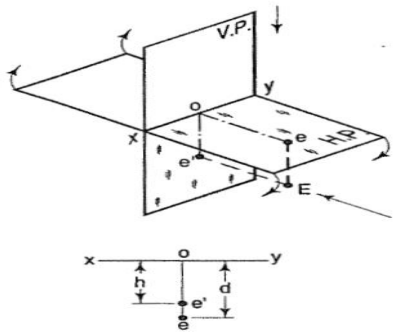
1st quadrant



2nd quadrant



3rd quadrant



4th quadrant

Theory of lines: A straight line is the shortest distance between two points. Hence, the projections of a straight line may be drawn by joining the respective projections of its ends which are points.

Projection of lines : to draw front view and top view and side view of line is called projection of line.

S no	Statement/position of line	Front view	Top view
1	Line is parallel to both HP & VP	True length and parallel to xy	True length and parallel to xy
2	Line is parallel to HP & perpendicular to VP	Point	True length and perpendicular to xy
3	Line is parallel to VP & perpendicular to HP	True length and perpendicular to xy	Point
4	Line is parallel to VP & inclined to HP	True length and inclined to xy	Shorter than true length and parallel to xy
5	Line is parallel to HP & inclined to VP	Shorter than true length and parallel to xy	True length and inclined to xy
6	Line is inclined to both HP & VP	Shorter than true length and inclined to xy	Shorter than true length and inclined to xy

EXERCISE 3

Q1 A line PQ, 90 mm long, is in the H.P. and makes an angle of 30° with the V.P. Its end P is 25 mm in front of the V.P. Draw its projections.

Q2 The length of the top view of a line parallel to the V.P. and inclined at 45° to the H.P. is SO mm. One end of the line is 12 mm above the H.P. and 25 mm in front of the V.P. Draw the projections of the line and determine its true length.

Q3 A line AB 50 mm long, has its end A in both the HP and the V.P. It is inclined at 30˚ to the and at 45˚ to the V.P. Draw its projections.

Q4 The top view of a 75 mm long line AB measures 65 mrn, while the length of its front view is 50 mm. Its one end A is in the H.P. and 12 mm in front of the V.P. Draw the projections of AB and determine its inclinations with the H.P. and the V.P.

Q5 A line AB, 65 mm long has its end A 20 mm above the H.P. and 25 mm in front of the V.P. The end B is 40 mm above the H.P. and 65 mm in front of the VP. Draw the projections of AB and show its inclinations with the H.P. and the V.P.

Q6 A line AB, 90 mm long, is inclined at 45° to the H.P. and its top view makes an angle of 60° with the V.P. The end A is in the H.P. and 12 mm in front of the V.P. Draw its front view and finds its true inclination with the V.P.

Q7 Draw the projections of the following points on the same ground line, keeping the projectors 25 mm apart.

A, in the H.P. and 20 mm behind the V.P.

B, 40 mm above the H.P. and 25 mm in front of the V.P.

C, in the V.P. and 40 mm above the H.P.

D,25 mm below the H.P. and 25 mm behind the V.P.

E, 15 mm above the H.P. and 50 mm behind the V.P.

F, 40 mm below the H.P. and 25 mm in front of the V.P.

G,in both the H.P. and the V.P.

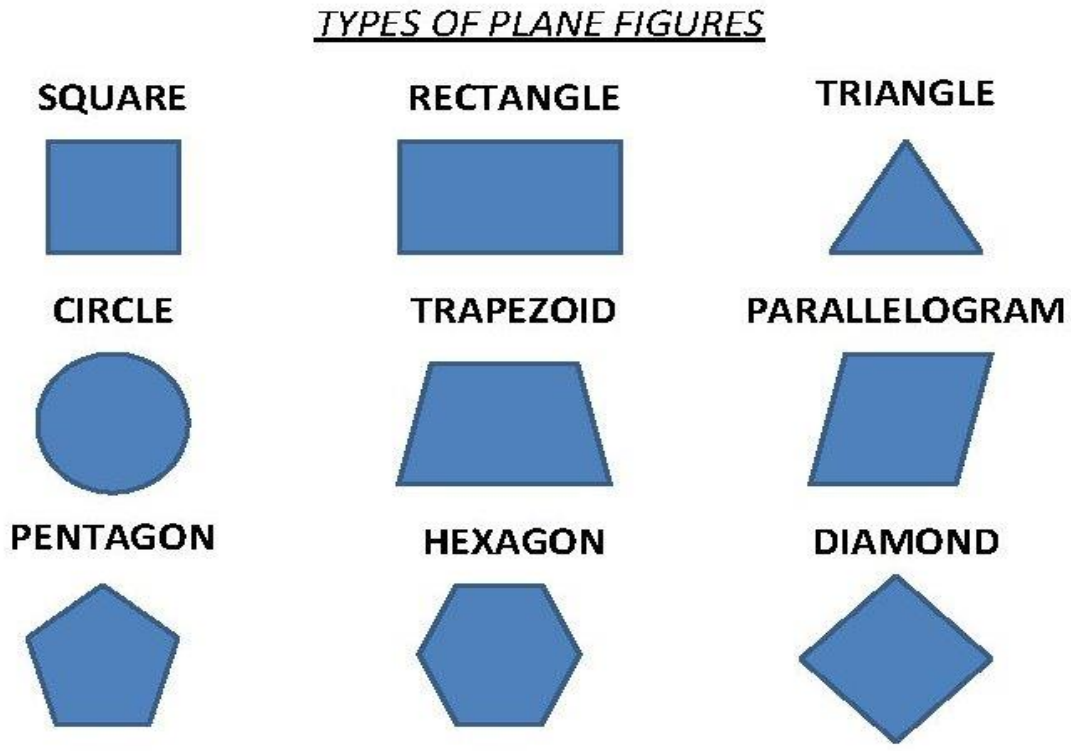
Experiment No: 4

Aim: Draw the problems on projection of planes on a given drawing sheet.

Tools used: Drawing instrument box , Mini drafter, roller scale, drawing sheets, holding clips etc.

Theory of point: a flat surface generated by moving a straight line in a space is called point.

Projection of planes: to draw front view and top view and side view of different planes is called projection of planes.



S no	Statement/position of plane	Front view	Top view
1	plane is perpendicular to both HP & VP	Line perpendicular to xy	Line perpendicular to xy
2	Plane is parallel to HP & perpendicular to VP	Line parallel to xy	True shape of plane
3	Plane is parallel to VP & perpendicular to HP	True shape of plane	Line parallel to xy
4	Plane is perpendicular to VP &	Line which is	Reduced shape of

	inclined to HP	inclined to xy	plane
5	plane is perpendicular to HP & inclined to VP	Reduced shape of plane	Line which is inclined to xy
6	Line is inclined to both HP & VP	Reduced shape of plane	Reduced shape of plane

EXERCISE 4

Q1 A regular pentagon of 25 mm side has one side on the ground. Its plane is inclined at 45° to the H.P and perpendicular to the VP Draw its projections.

Q2 Draw the projections of a circle of 50 mm diameter having its plane vertical and inclined at 30° to the V.P. Its centre is 30 mm above the H.P. and 20 mm in front of the V.P.

Q3 A square ABCO of 50 mm side has its corner A in the H.P., its diagonal AC inclined at 30° to the H.P. and the diagonal BO inclined at 45° to the V.P. and parallel to the H.P. Draw its projections.

Q4 Draw the projections of a regular hexagon of 25 mm side, having one of its sides in the H.P. and inclined at 60° to the V.P., and its surface making an angle of 45° with the H.P.

Q5 A thin 30°-60° set-square has its longest edge in the V.P. and inclined at 30° to the H.P. Its surface makes an angle of 45° vvith the V.P. Draw its projections.

Experiment No: 5

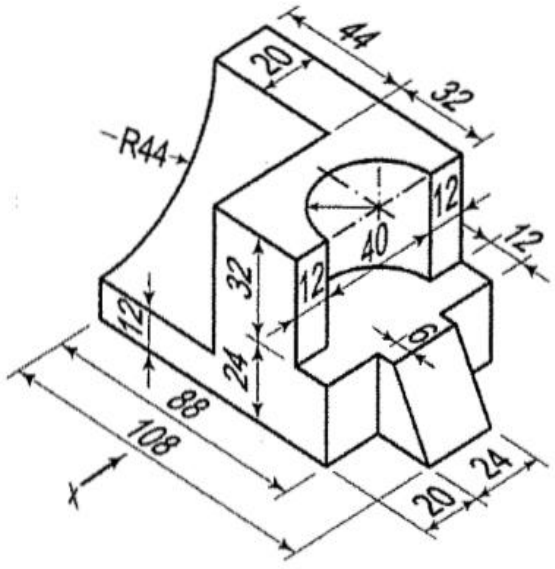
Aim: Draw the orthographic projection of a given object with and without section on a drawing sheet.

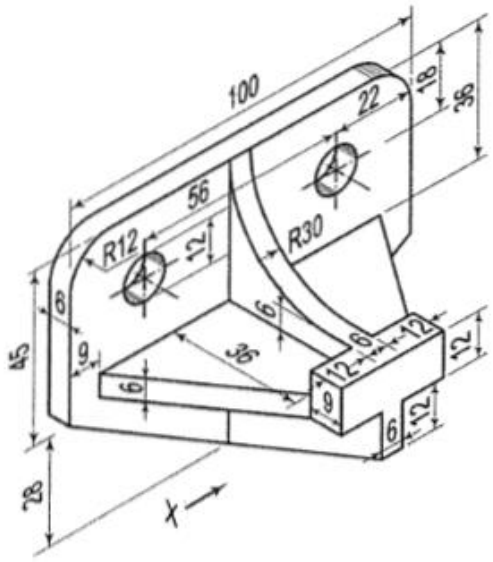
Tools used: Drawing instrument box , Mini drafter, roller scale, drawing sheets, holding clips etc.

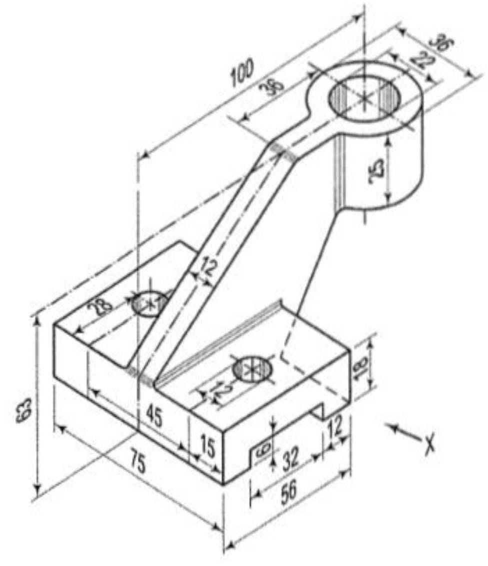
Theory of orthographic projection: orthographic projection, any one view shows only two dimensions of a three dimensioned object. Hence, it is impossible to visualize the shape of the object from a single view. The second view shows the third dimension. Thus, at least two views are necessary to determine its shape. Sometimes, a third view is also necessary to completely visualize an object.

EXERCISE 5

Q1 Draw front view,top view and side view of different object which is given below



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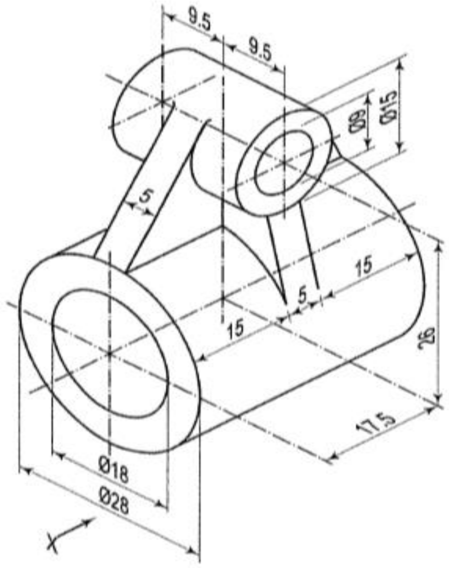
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Ø28
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Experiment No: 6

Aim: Draw the projection of solid and section of solid on a drawing sheet.

Tools used: Drawing instrument box , Mini drafter, roller scale, drawing sheets, holding clips etc.

Theory of solid :an object having 3 dinmensions ie length breadth and height is called solid .

Types of solid

a) Polyhedra : A polyhedron is defined as a solid bounded by planes called faces. When all faces are equal and regular, the polyhedron is said to be regular. There are seven regular polyhedra which may be defined as stated below:

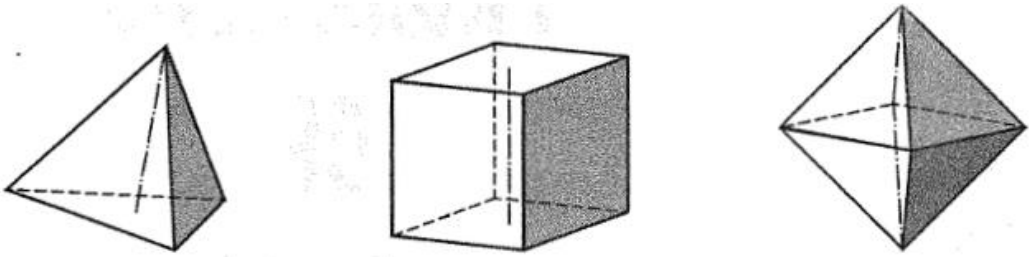
(i) Tetrahedron : It has four equal faces, each an equilateral triangle.

(ii) Cube or hexahedron : It has six faces, all equal squares.

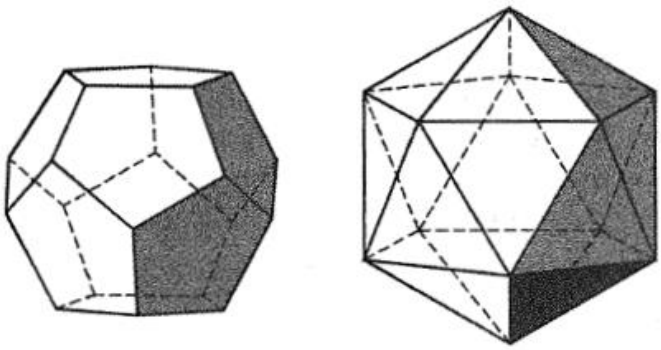
(iii) Octahedron : It has eight equal equilateral triangles as faces.

(iv) Dodecahedron : It has twelve equal and regular pentagons as faces.

(v) Icosahedron: It has twenty faces, all equal equilateral triangles.

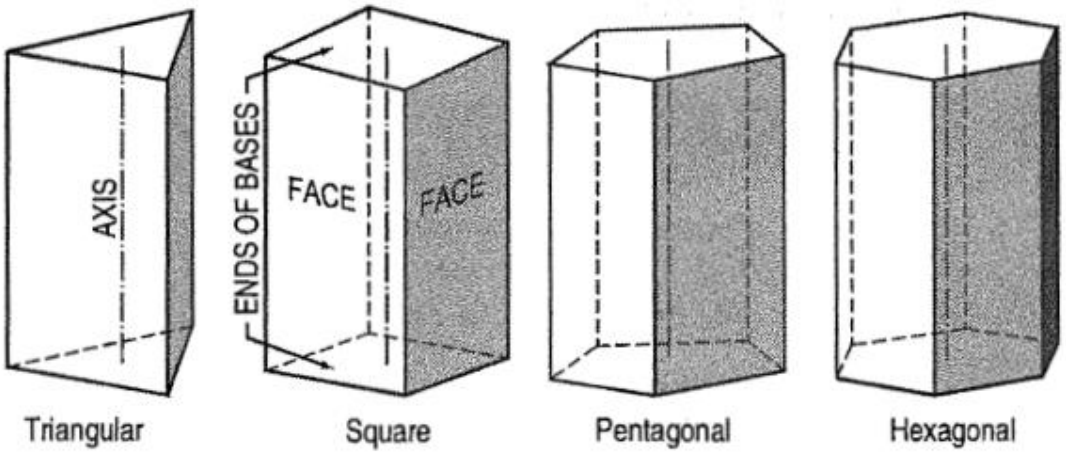


Tetrahedron Cube Octahedron



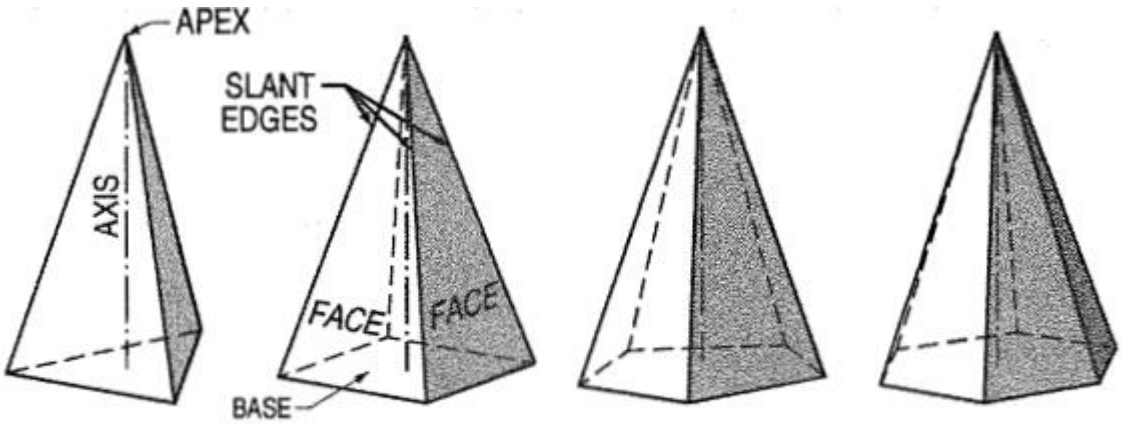
Dodecahedron Icosahedron

(vi) Prism: This is a polyhedron having two equal and similar faces called its ends or bases, parallel to each other and joined by other faces which are parallelograms. The imaginary line joining the centres of the bases is called the axis. All its faces are equal rectangles



Prisms

(vii) Pyramids : This is a polyhedron having a plane figure as a base and a number of triangular faces meeting at a point called the vertex or apex. The imaginary line joining the apex with the centre of the base is its axis. Its faces are all equal isosceles triangles.



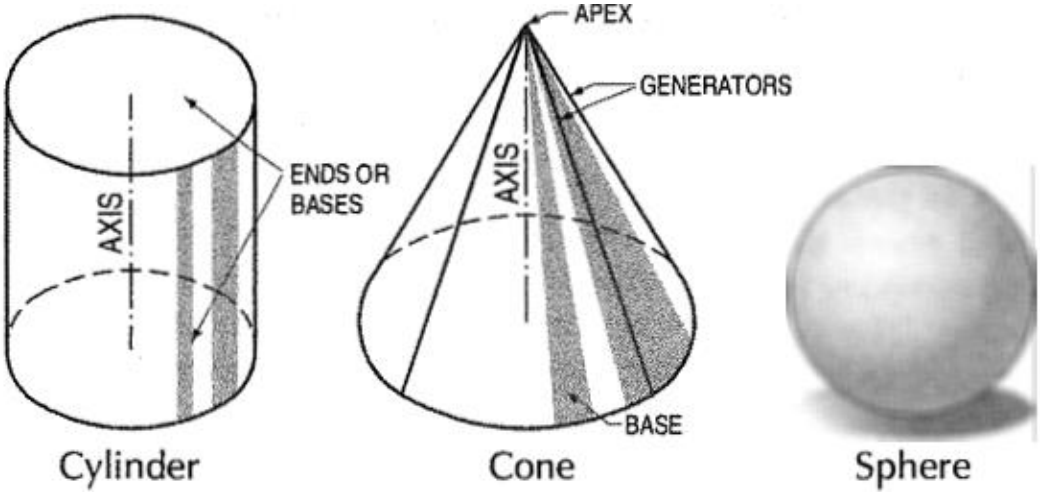
Pyramids

b) Solids of revolution.

(i) Cylinder : A right circular cylinder is a solid generated by the revolution of a rectangle about one of its sides which remains fixed. It has two equal circular bases. The line joining the centres of the bases is the axis. It is perpendicular to the bases.

(ii) Cone : A right circular cone is a solid generated by the revolution of a right-angled triangle about one of its perpendicular sides which is fixed. It has one circular base. Its axis joins the apex with the centre of the base to which it is perpendicular. Straight lines drawn from the apex to the circumference of the base-circle are all equal and are called generators of the cone. The length of the generator is the slant height of the cone.

(iii) Sphere : A sphere is a solid generated by the revolution of a semi-circle about its diameter as the axis. The mid-point of the diameter is the centre of the sphere. All points on the surface of the sphere are equidistant from its centre.



EXERCISE 6(projection of solid)

Q1 Draw the projections of a triangular prism, base 40 mm side and axis 50 mm long, resting on one of its bases on the H.P. with a vertical face perpendicular to the V.P.

Q2 Draw the projections of a pentagonal pyramid, base 30 mm edge and axis 50 mm long, having its base on the H.P. and an edge of the base parallel to the V.P. Also draw its side view.

Q3 A cube of 50 mm long edges is resting on the H.P. with its vertical faces equally inclined to the V.P. Draw its projections.

Q4 Draw the projections of a hexagonal pyramid, base 30 mm side and axis 60 mm long, having its base on the H.P. and one of the edges of the base inclined at 45° to the V.P.

Q5 A square pyramid, base 40 mm side and axis 65 mm long, has its base in the V.P. One edge of the base is inclined at 30° to the H.P. and a corner contained by that edge is on the H.P. Draw its projections.

Q6 Draw the projection of a pentagonal prism, base 25 mm side and axis 50 rnm long resting on one of its rectangular faces on the HP with the axis inclined at 45˚ to the V.P.

Q7 Draw the projections of a cone, base 45 mm diameter and axis 50 mm long, when it is resting on the ground on a point on its base circle with (a) the axis making an angle of 30° with the H.P. and 45° with the V.P.; (b) the axis making an angle of 30° with the H.P. and its top view making 45° with the V.P

Q8 A pentagonal pyramid, base 25 mm side and axis 50 mm long has one of its triangular faces in the V.P. and the edge of the base contained by that face makes an angle of 30° with the H.P. Draw its projections.

EXERCISE6.1(Section of solid)

Q1 A pentagonal prism side of base 30mm and axis 50mm long stands on HP on its base perpendicular to VP.It is cut by a sectional plane 45˚ inclined to the HP and passing through the centre of the axis . Draw sectional top view and sectional side view also draw true shape of section.

Q2 A square prism side of base 40mm and axis 70mm long stands on HP on its base with all sides of base making equal angle to VP. It is cut by a section plane passing through the left bottom corner and top right corner of elevation perpendicular to VP. Draw sectional top view and sectional side view also draw true shape of section.

Q3 a cylinder of 50mm diameter and 70mm height has its axis vertical.it is cut by a section plane perpendicular to vp and inclined 45˚ to HP and intersecting the axis 40mm above the base. Draw sectional top view and sectional side view also draw true shape of section.

Q4 a square pyramid of 30mm side and axis 50mm is resting on its base in HP. Edge of base are equally inclined to VP. It is cut by a sectional plane perpendicular to vp and inclined 45˚ to HP. The planes cut the axis 10mm above

the base . Draw sectional top view and sectional side view also draw true shape of section.

Q5 a cone of diameter of base 50mm an axis 50mm long is resting on its base on the hp.it is cut by a sectional plane perpendicular to vp and inclined at 75degree to hp and passing through the apex. Draw sectional top view and sectional side view also draw true shape of section.

Q6 A cube of 35 mm long edges is resting on HP on one of its faces with a vertical face inclined at 30 degree to the vp. It is cut by a sectional plane parallel to the VP and 9mm away from the axis .DRAW its sectional front view and top view.

Experiment No: 7

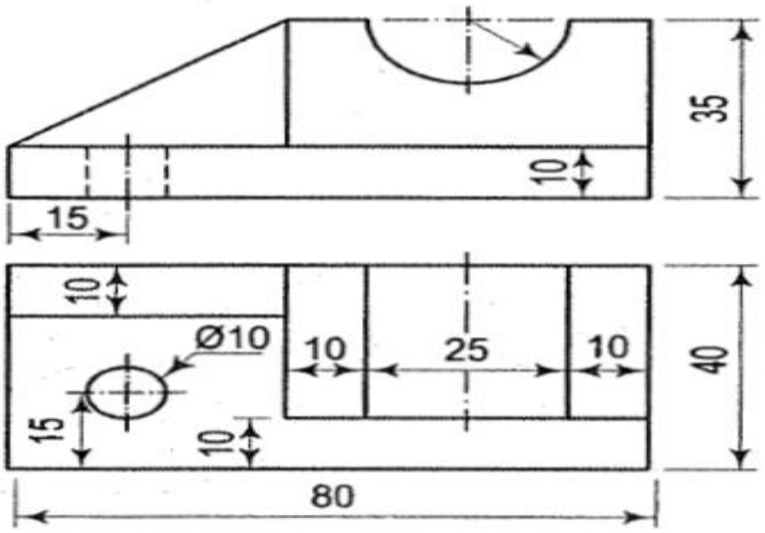
Aim: Draw the isometric projection/view of simple machine element.

Tools used: Drawing instrument box, Mini drafter, roller scale, drawing sheets, holding clips etc.

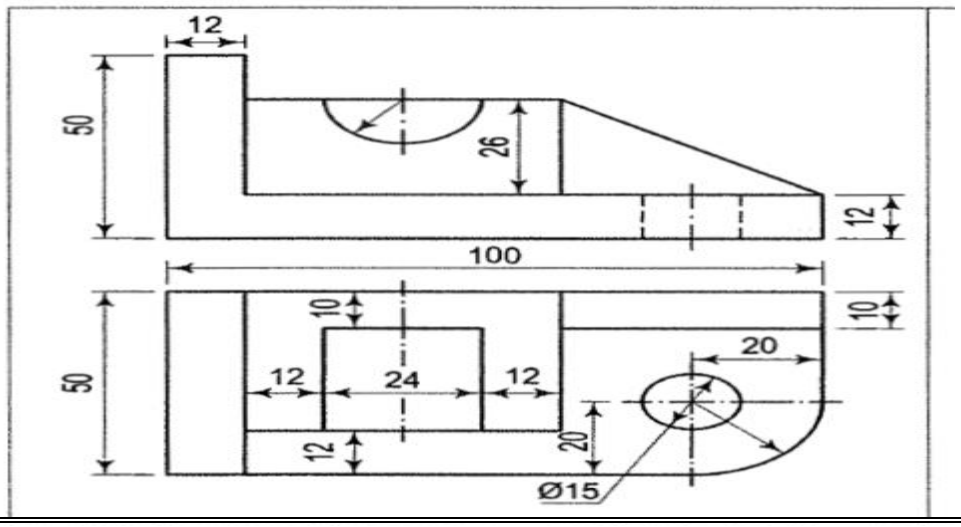
Theory of isometric: Isometric projection is a type of pictorial projection in which the three dimensions of a solid are not only shown in one view, but their actual sizes can be measured directly from it.

Excersise 7(Draw isometric view)

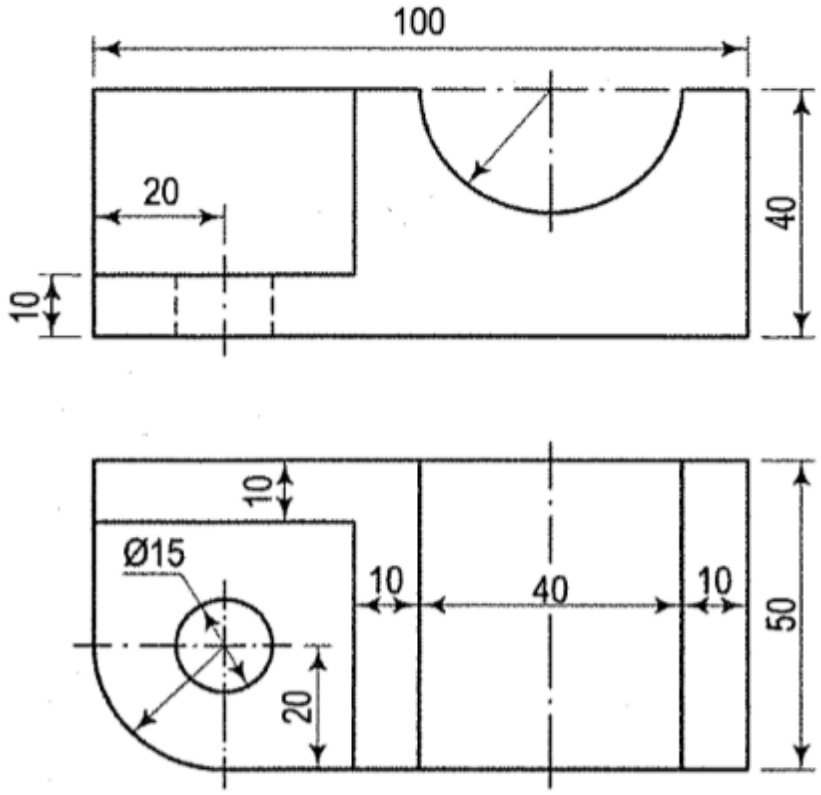
Q1 Draw the isometric view of a cone, base 40 mm diameter and axis 55 mm long (i) when its axis is vertical and (ii) when its axis is horizontal.
Q2 A cylindrical block of base, 60 mm diameter and height 80 mm, standing on the H.P. with its axis perpendicular to the H.P. Draw its isometric view.
Q3



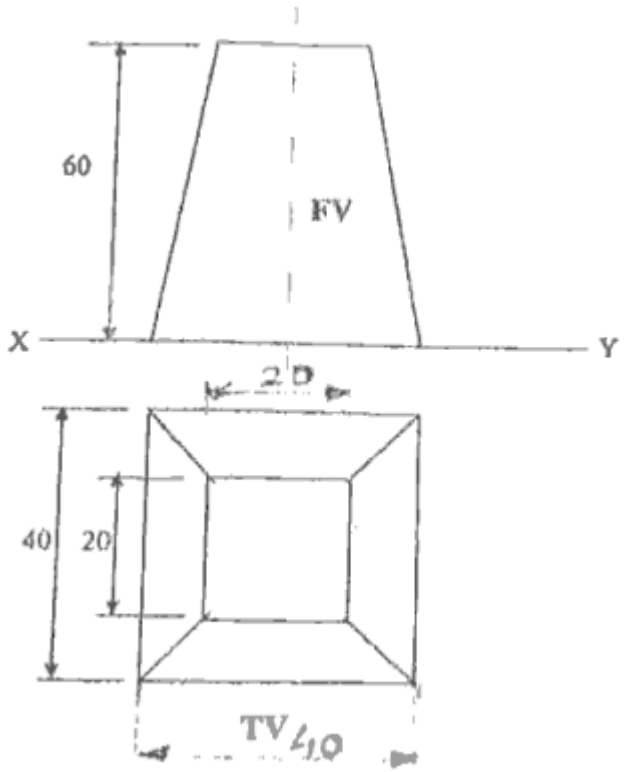
Q4



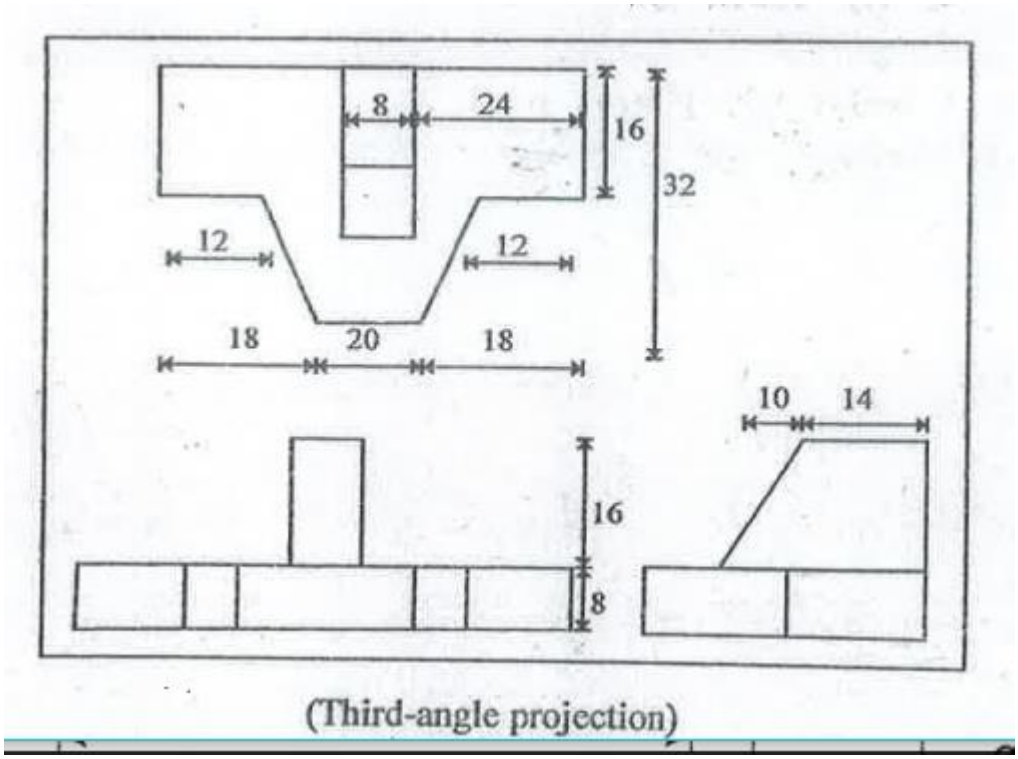
Q5



Q6



Q7



(Third-angle projection)

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