



ENGINEERING GRAPHICS

UNIT V

ISOMETRIC PROJECTION

PERSPECTIVE PROJECTION



1. PICTORIAL PROJECTIONS

- To **visualize the shape** of the whole object in its 3-D form, all the **two or three** orthographic views of the object have to be read simultaneously and a **conclusion** is to be drawn mentally about its shape.
- Engineers often find that they must prepare pictorial drawings, showing **three or more number of faces in one view** to convey the technical information to technically lay persons.
- Pictorial drawings are obtained by projecting an object only on **one plane of projection**.

Types of Pictorial Projections

1. Isometric Projection:

An Isometric Projection is a pictorial projection in which **three dimensions of a solid are not only shown in one view, but also their dimensions can be measured** from it directly.

2. Perspective Projection:

It shows an object as it appears instead of its **true shape and size.**

2. PRINCIPLE OF ISOMETRIC PROJECTION

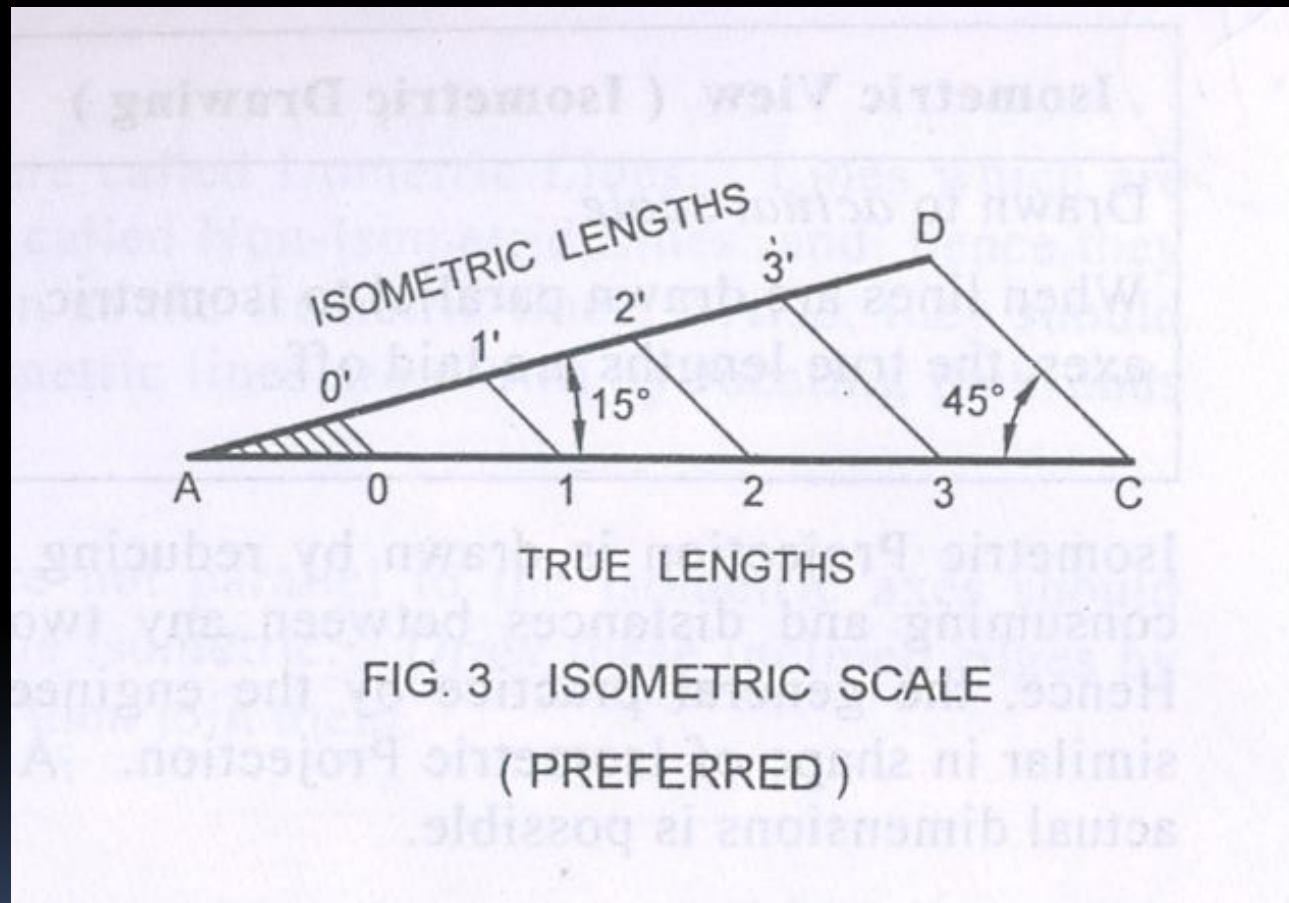
What is Isometric Projection?

- **Iso** means equal
- **Metric** means measure
- **Isometric Projection** means a system of projection of equality of measure.

Ex:

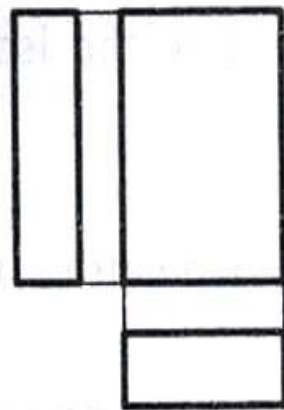
Projection of a Cube, resting on HP on one of its corners with a **solid diagonal** (Solid Diagonal is an imaginary line joining one of the corners at the top and the diametrically opposite corner at the bottom) perpendicular to HP.

ISOMETRIC SCALE



$$\text{Isometric Projection} = \text{True length(TL)} \times .82$$

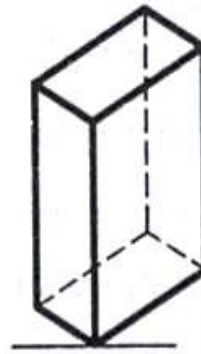
DIFFERENCE BETWEEN ORTHOGRAPHIC, ISOMETRIC PROJECTIONS, ISOMETRIC VIEW



ORTHOGRAPHIC
PROJECTIONS

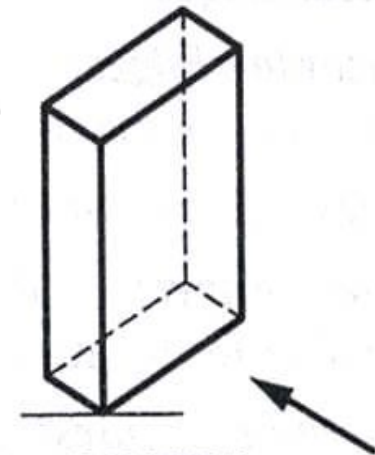
FIG. 4

(a)



ISOMETRIC
PROJECTIONS

(b)



ISOMETRIC
VIEW

(c)

ISOMETRIC VIEW

Isometric View (Isometric Drawing)

1. Draw to actual scale.
2. When lines are drawn parallel to isometric axes, the true lengths are laid off.

Isometric Projection

1. Drawn to isometric scale.
When lines are drawn parallel to isometric axes, the length are foreshortened to 0.82 times the actual

ISOMETRIC PROJECTION OF SQUARE – HORIZONTAL AND VERTICAL

Draw the isometric projection of a **square** lamina of side 35mm when it is placed with its surface. (a) Vertical and

(b) Horizontal

Case (a): Square – Vertical

Note: In Isometric projection/view, draw the vertical lines vertical and the horizontal lines inclined at an angle of 30° to the horizontal

Case (b): Square – Horizontal

Take one corner draw lines both side 30°

ISOMETRIC PROJECTION OF SQUARE – VERTICAL AND HORIZONTAL

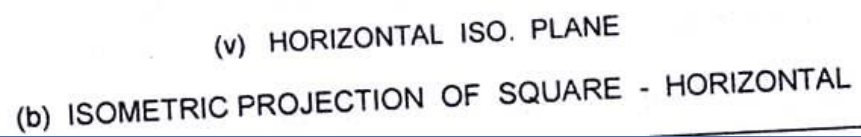
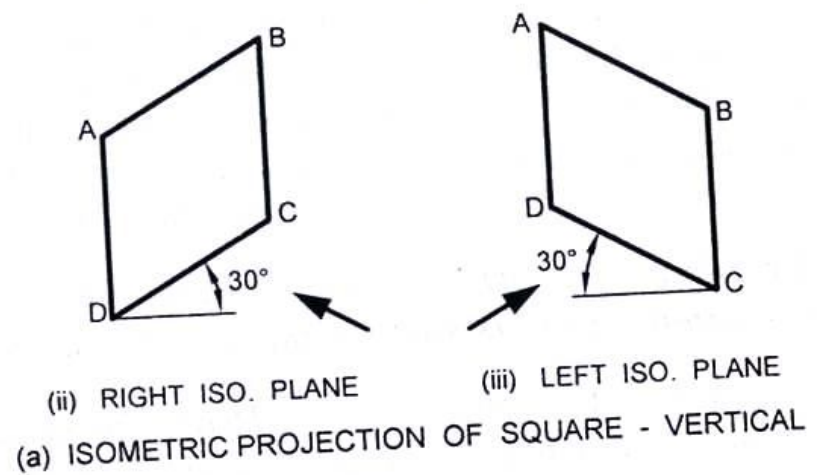
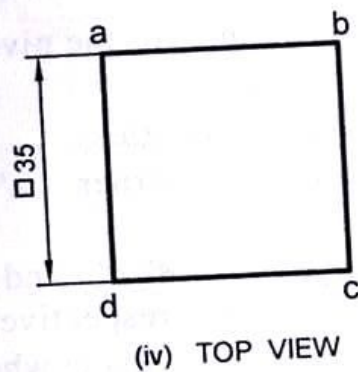
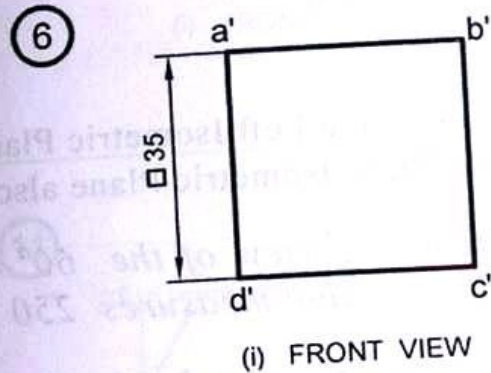
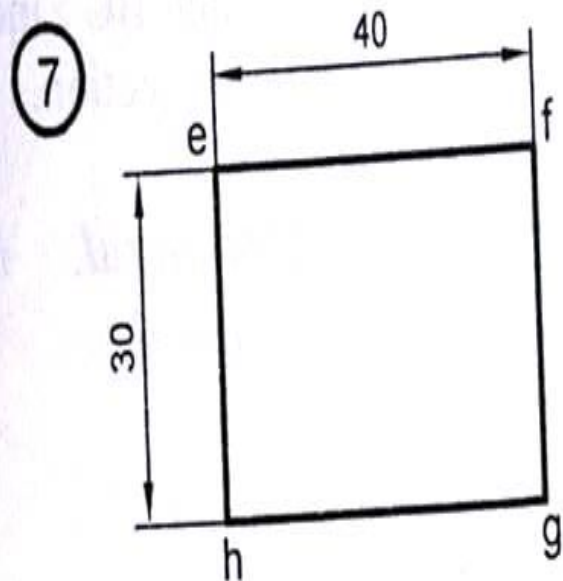
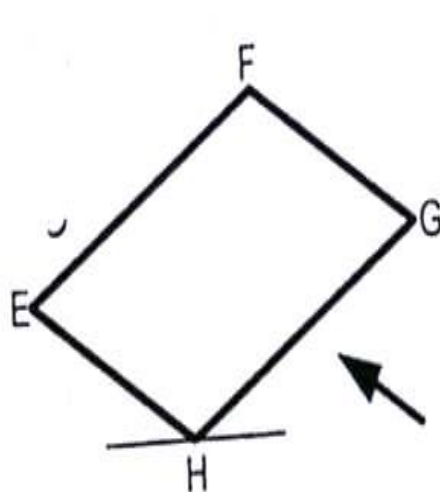


FIG. 13

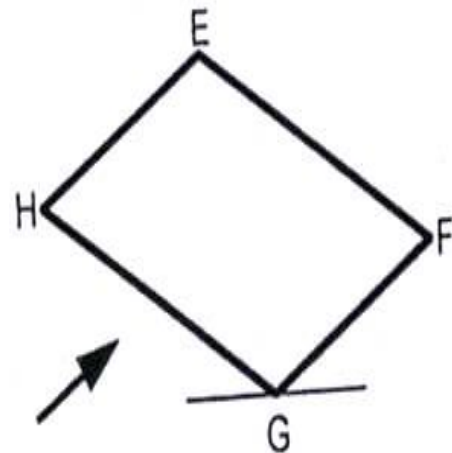
ISOMETRIC PROJECTION OF RECTANGLE - HORIZONTAL



(i) TOP VIEW



(ii) RIGHT ISO. PLANE



(iii) LEFT ISO. PLANE

ISOMETRIC PROJECTION OF RECTANGLE - HORIZONTAL

FIG. 14

Isometric Projection of Prism

Draw the isometric projection of a square prism of side of base 35mm and height 65mm when its axis is (i) vertical and (ii) horizontal.

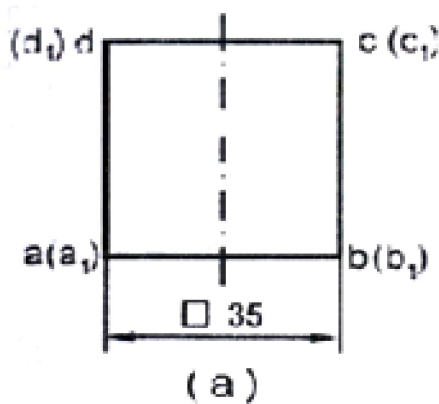
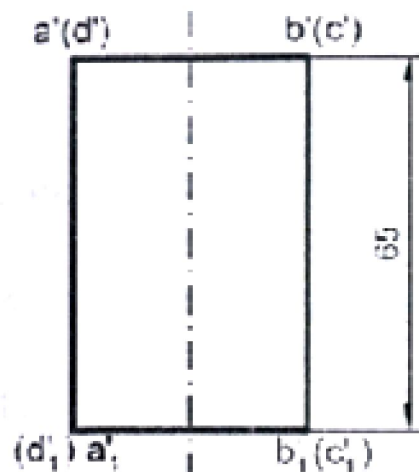
Case (i) Axis of the square prism is vertical

Case (ii) Axis of the square prism is horizontal

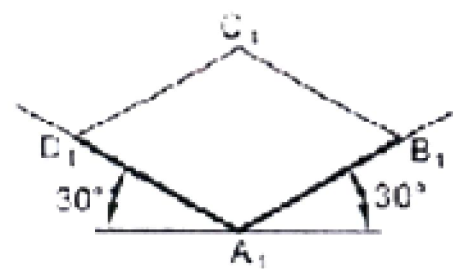
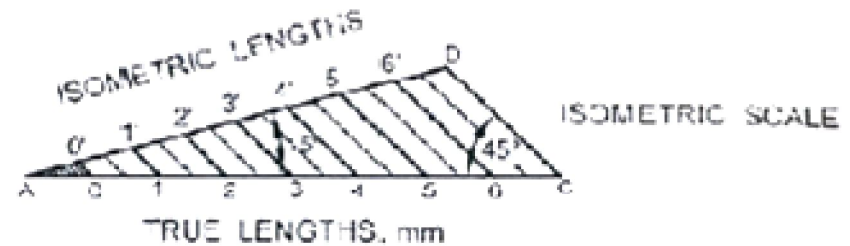
Note: In isometric projection/view, hidden lines are not generally shown.

Isometric Projection of Prism

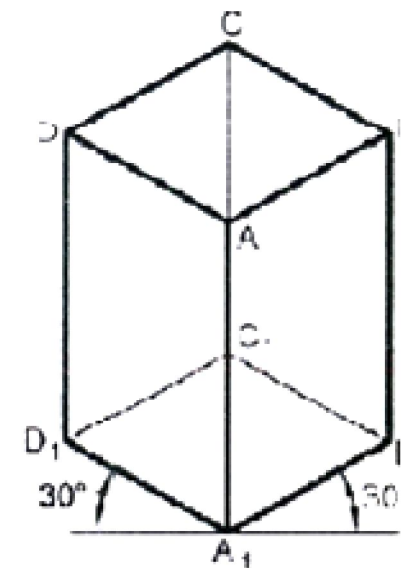
17



(a)

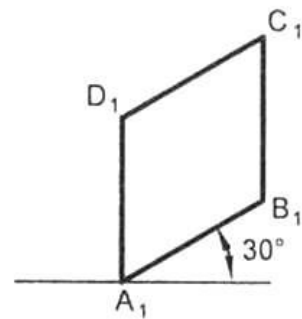


(b)

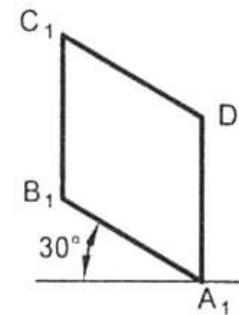


(c)

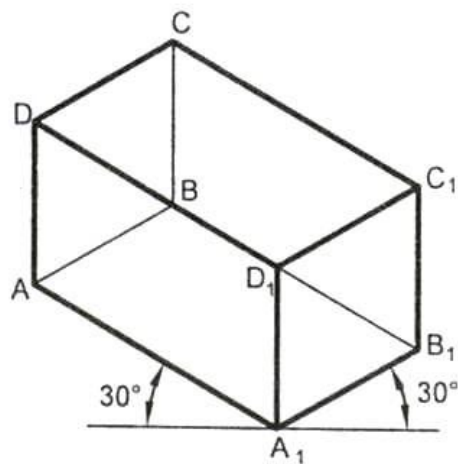
ISOMETRIC PROJECTION OF PRISM



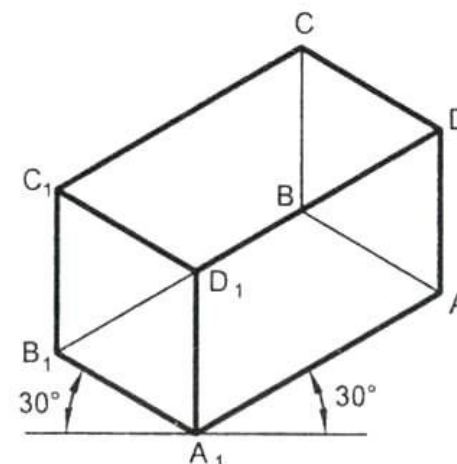
(d)



(e)



(f)



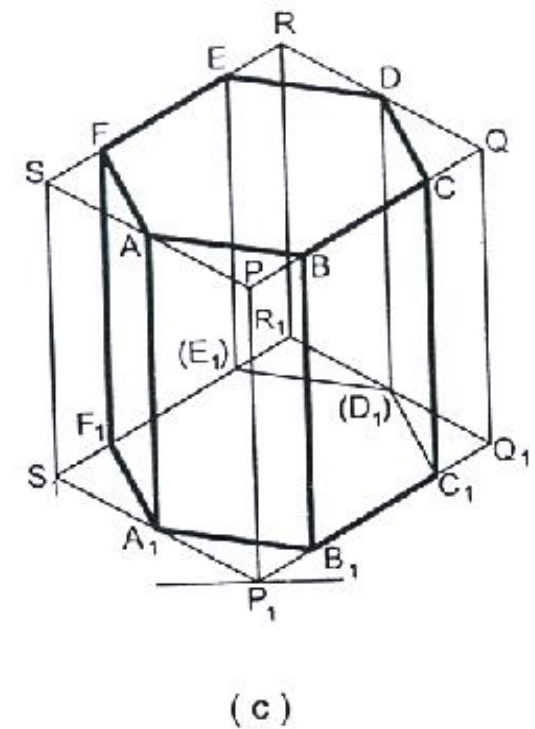
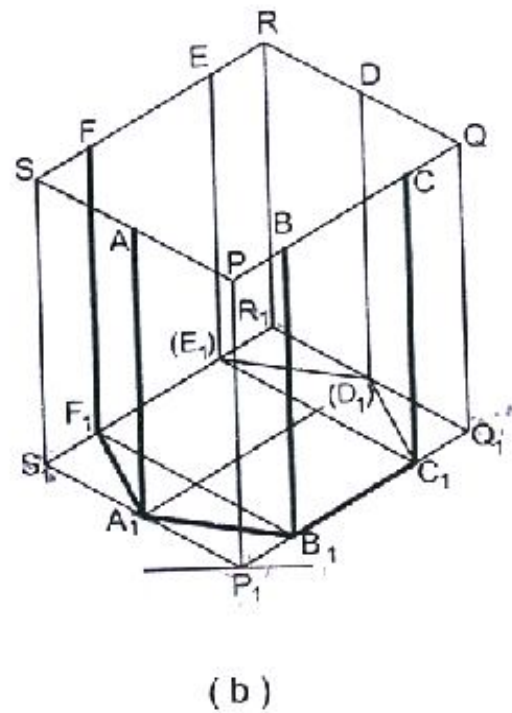
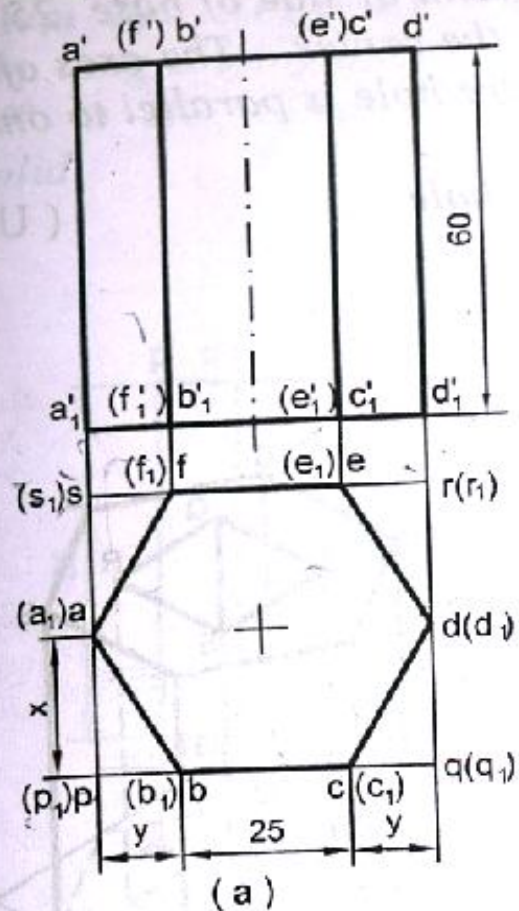
(g)

Isometric Projection of Prism

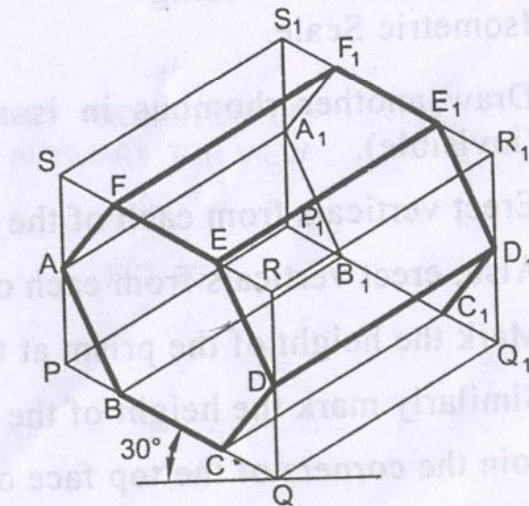
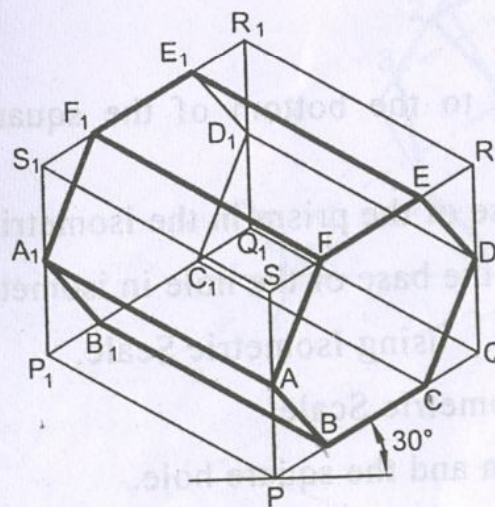
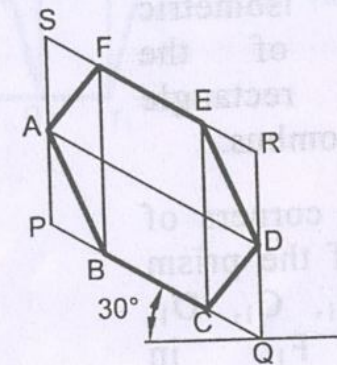
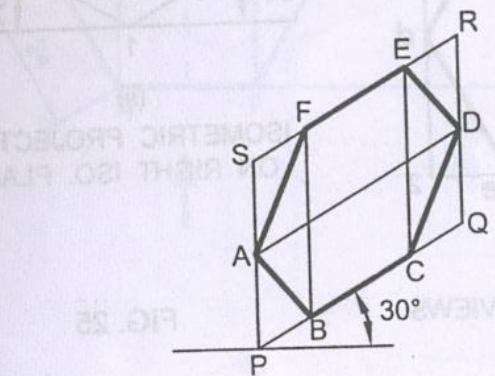
Problem 25: Draw the three possible ways of representing the isometric projection of a hexagonal prism, side of base 25mm and height 60mm.

RULE: Make direct measurements only on Isometric Lines. Lengths of edges cannot be transferred on Non-Isometric Lines. (e.g., B1 should not be marked on P1Q1 by cutting an arc on it with A1 as center and isometric length off (a1)(b1) as radius.

Isometric Projection of Prism



Isometric Projection of Prism



(d)

(e)

FIG. 24

SECTIONED SOLIDS – TRUNCATED AND FRUSTUM

Problem 40: A pentagonal pyramid, base 30mm and axis 65mm long, rests with its base on HP. An edge of the base is parallel to VP and nearer to it. A horizontal section plane cuts the pyramid and passes through a point on the axis at a distance of 25mm from the apex. Draw the isometric projection of the frustum of the pyramid. (UQ)

Isometric Projection of Truncated Pyramid

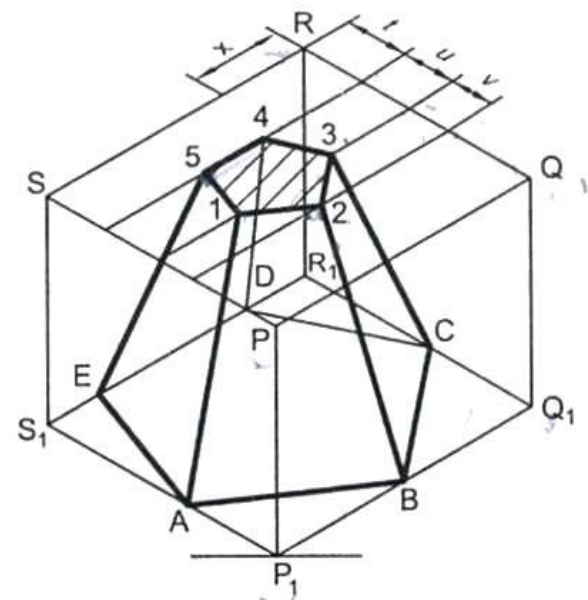
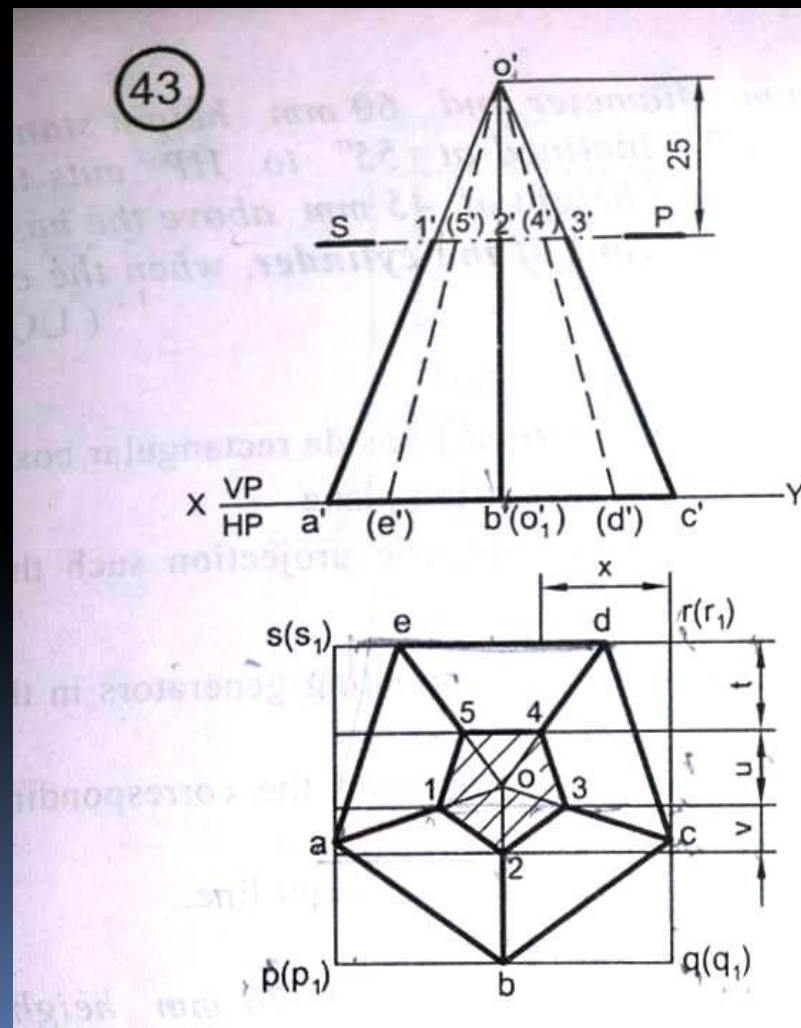


FIG. 36

Isometric Projection of Truncated Prism

Problem 42:

A hexagonal prism, side of base 25mm and height 50mm rests on HP and one of the edges of its base is parallel to VP. A section plane perpendicular to VP and inclined at 50° to HP bisects the axis of the prism. Draw the isometric projection of the truncated prism. Showing the cut surface.

Isometric Projection of Truncated Prism

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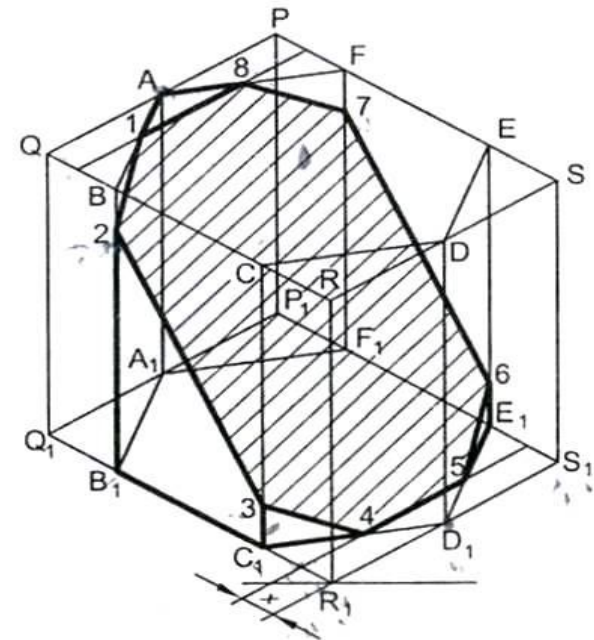
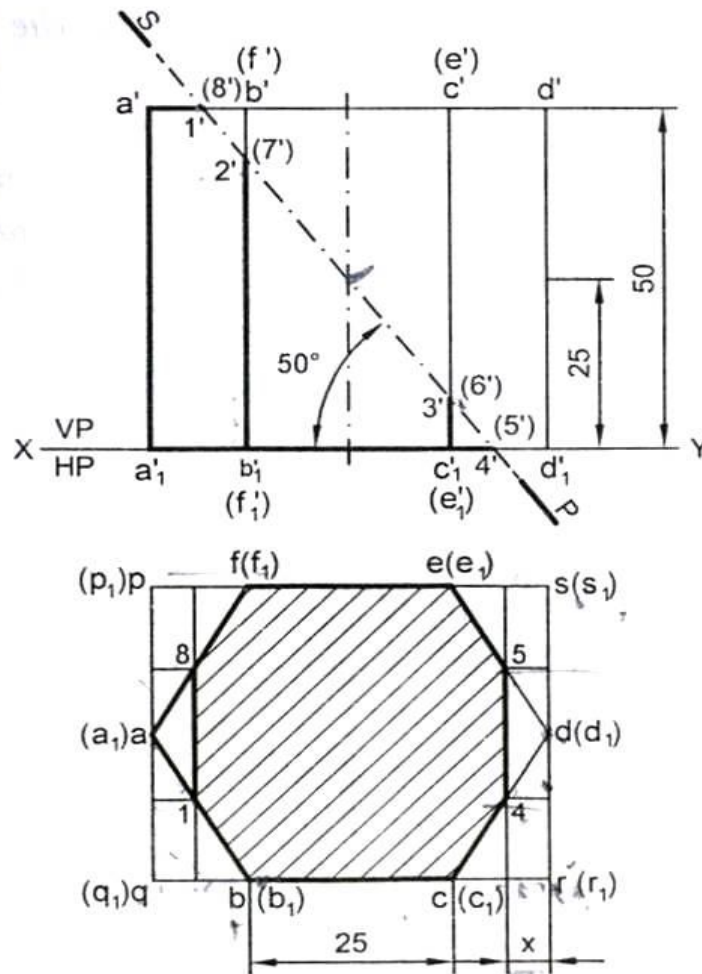


FIG. 37

Isometric Projection of Truncated Cylinder

A **cylinder** 50mm diameter and 60mm height stands on HP. A section plane perpendicular to VP, inclined at 55° to HP cuts the cylinder and passes through a point on the axis at a height of 45mm above the base. Draw the isometric projection of the **truncated portion of the cylinder**, when the cut surface is clearly visible to the observer.

Isometric Projection of Truncated Cylinder

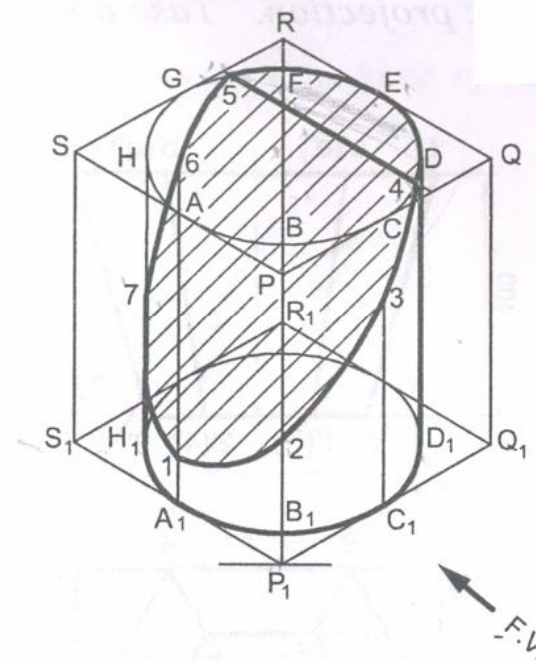
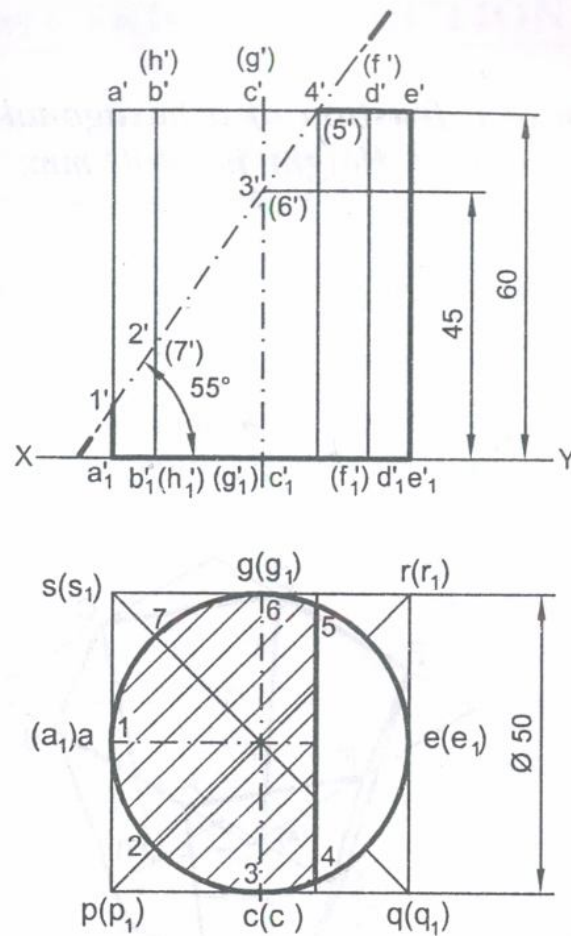


FIG. 38

Isometric Projection of Truncated Pyramid

Problem 46: A **pentagonal pyramid**, 30mm edge of base and 65mm height, stands on HP such that an edge of the base is parallel to VP and nearer to it. A section plane perpendicular to VP and inclined at 30° to HP cuts the pyramid passing through a point on the axis at a height of 35mm from the base.

Draw the isometric projection of the **truncated pyramid**, showing the cut surface. (UQ)

SECRET





PERSPECTIVE PROJECTION

PRINCIPLE OF PERSPECTIVE PROJECTION

- **Perspective projection** of the graphic representation of an object on a single plane, as it appears to an observer, station at a particular position relative to the object. The plane is transparent and vertical and is called **Picture Plane (PP)**.
- It is due to optical illusion. In perspective projection, the object is placed behind the PP. The observer is stationed in front of PP. Therefore, visual rays from the eyes of the observer to the object are cut by the PP, i.e., the rays pierce the picture plane and form an image on it.
- This **image** is the **perspective view of the object**. Visual rays locate the position of the object on the PP.

PERSPECTIVE PROJECTION

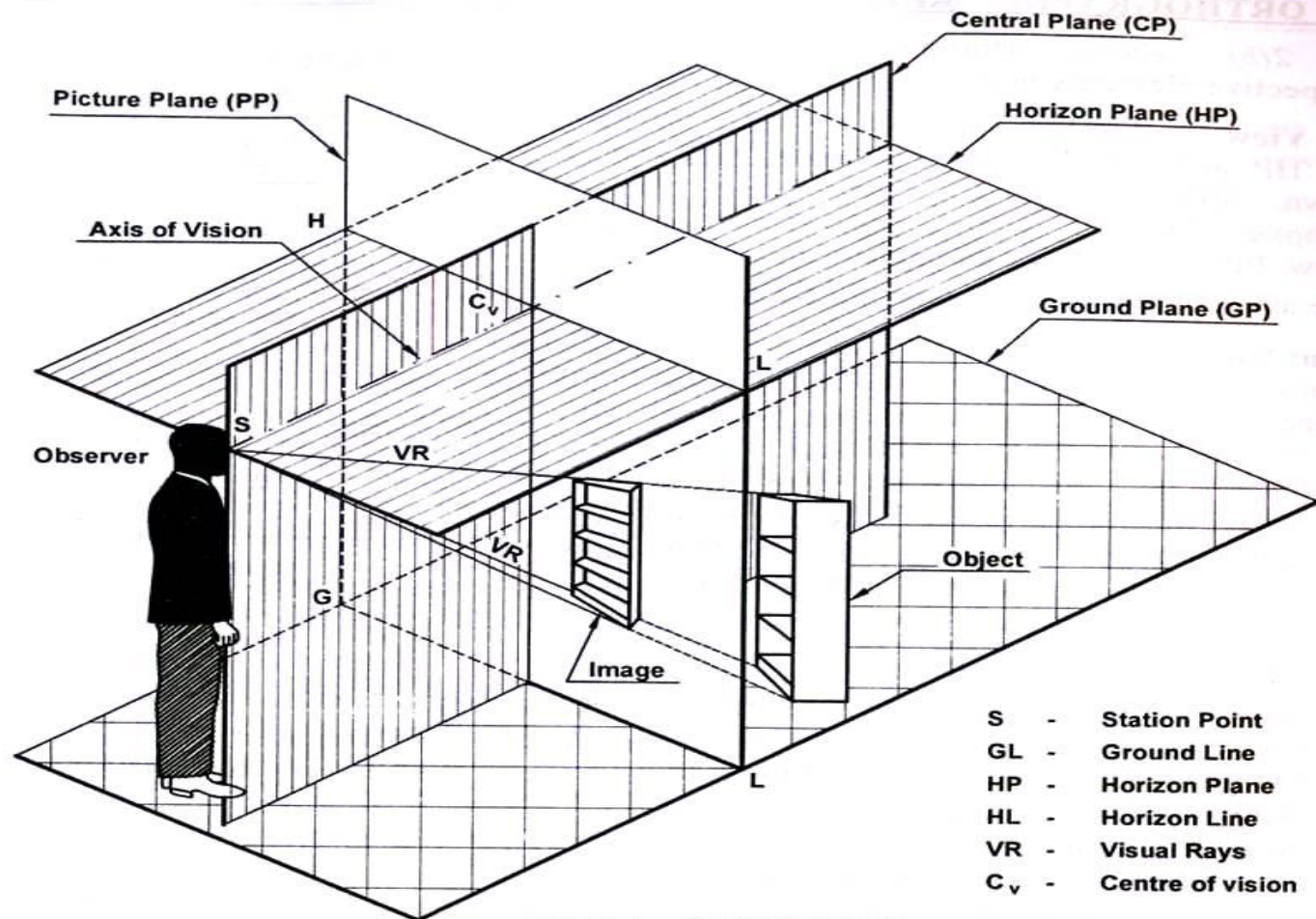


FIG. 2(a) TERMINOLOGY

Third Angle Projection

- In perspective projection, PP is placed between the object and the eye. The arrangement of the eye, picture plane and the object is the same as in the case of Third Angle Projection.
- Therefore, the top view of the object is drawn above the front view.

Visual Ray Method

- In visual ray method, the top view and front view (or side view) of the object and position of the station point(SP) in both the views are located.
- Then visual rays from SP connecting various corners of the object in top and front views are drawn.
- The piercing points of these rays with picture plane are marked in top view and projected to front view to get perspective projection of the object.

Problems:

- Draw the perspective view of a **square pyramid** of base 30mm side and height of apex 45mm. The nearest edge of the base is parallel to and 20mm behind the picture plane. The station point is situated at a distance of 70mm in front of the PP and 40mm to the right of the axis of the pyramid and 60mm above the ground.
- A **hexagonal pyramid** of base side 25mm and axis length 50mm is resting on GP on its base with a side of base is parallel to and 20mm behind PP. The station point is 60mm of the pyramid. Drawing the perspective view of the pyramid.

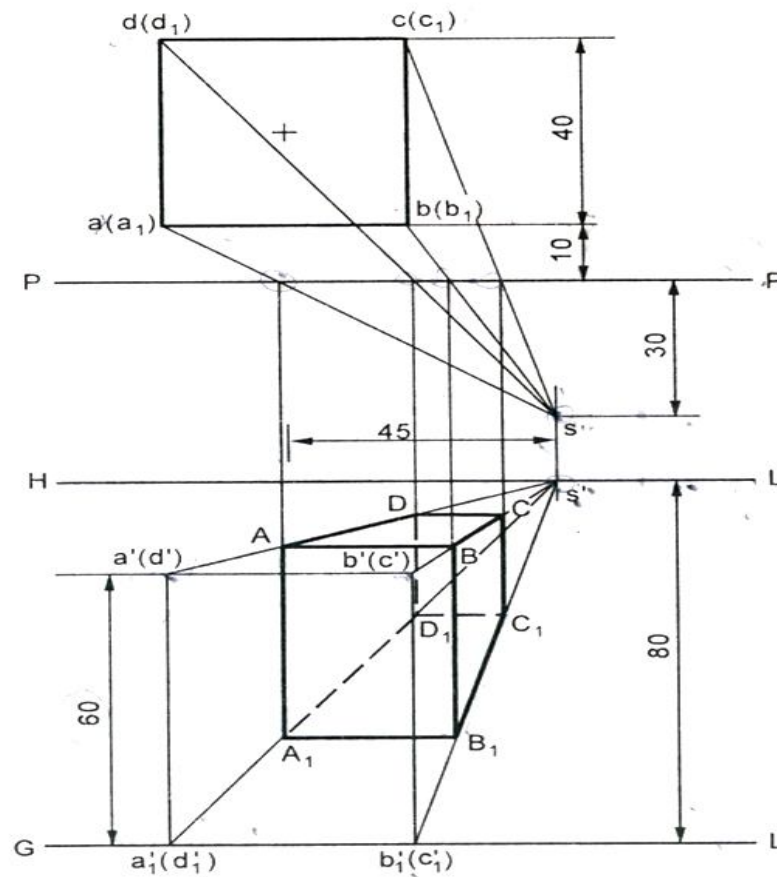
PERSPECTIVE PROJECTION OF SOLIDS

Problem 13:

A square prism, side of base 40mm and height 60mm rests with its base on the ground such that one of its rectangular faces is parallel to and 10mm behind the picture plane. The station point is 30mm in front of PP, 80mm above the ground plane and lies in a central plane 45mm to the right of the center of the prism. Draw the perspective projection of the square prism

Visual Ray Method

VISUAL RAY METHOD



VISUAL RAY METHOD

- A square prism of base $25 \times 25\text{mm}$ and height 40mm rests on the GP on one of its ends with a rectangular face receding away from the PP towards right making 60° with PP. The corner nearest to the PP is 40mm to the left of the station point and 20mm behind the PP. The station point is 60mm above the GP and 50mm in front of the PP. Draw the perspective view of the prism by visual ray method. Use the top view and the front view.
- A cylinder of diameter 40mm and height 40mm rests on the GP on one of its ends with its axis 35mm behind the picture plane. The station point is 45mm to the right of the axis. The station point is 65mm above the GP and 40mm in front of the PP. Draw the perspective view of the cylinder by visual ray method.

- Draw the perspective view of a pentagonal prism of base side 20mm and height 40mm when it rests on its base on the ground plane with one of its rectangular faces parallel to and 20mm behind the picture plane. The station point is 45mm in front of the PP and 60mm above the GP. The observer is 20mm to the left of the axis. Use the top view and the end view to draw the perspective by visual ray method.
- A cube of side 30mm is resting on a face on the ground such that one of its faces is parallel to PP and the centre of the solid is 5mm behind the PP. The central plane is located 30mm to the left of the nearest vertical face of cube the station point is 40mm in front of PP and 50mm above GP. Draw the perspective view of the solid.



Wish you a good
Luck

