



**Engineering Drawing I**  
**Mid Term Examination Spring**  
**Semester- 2021**

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## ASSIGNMENT

**Q1:** Write in detail about the orthographic to isometric projections?

**Ans:** Orthographic Projection shows you the true size of the object, if you are drawing on 1:1 scale but Isometric Projection do not.

Orthographic Projection is used for making the projects but Isometric Projection is used to have better understanding of the object.

Orthographic drawings are typically two dimensional views of an object. For instance, if you were designing a table, you would draw a top view, side view and a bottom view. Should these three views not fully explain the design of the table other views would need to be drawn. When drawing a perspective view in an orthographic manner, you would utilize a 45 degree triangle for the lines that extend back or forward from the vertical lines. This type of perspective is not a true perspective because you can measure the true length of all the details shown.

The orthographic/parallel enables to create single/multiple views of the object. So sometimes it's also called multi-view drawing. This gives you true shapes & true dimensions of the object.

### **Orthographic:**

To understand this consider the following

- An observer
- An object
- A plane

As shown in figure-1

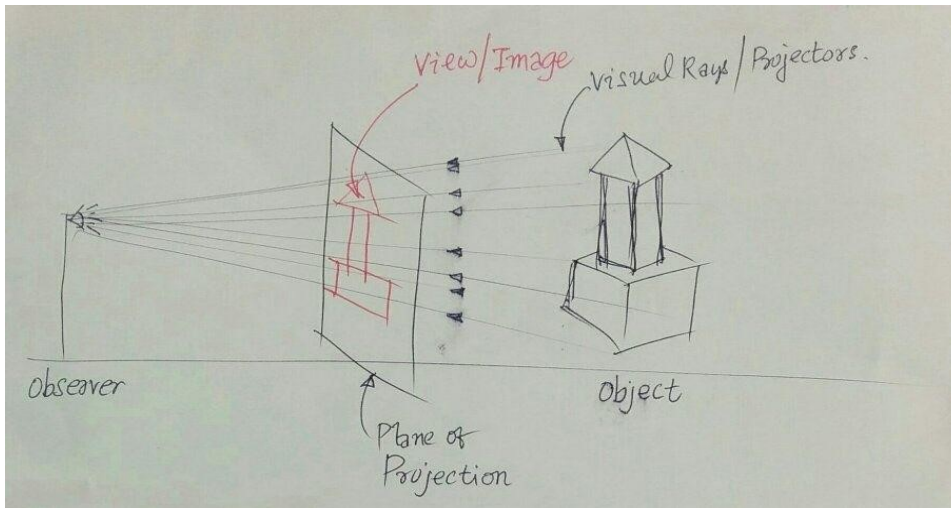
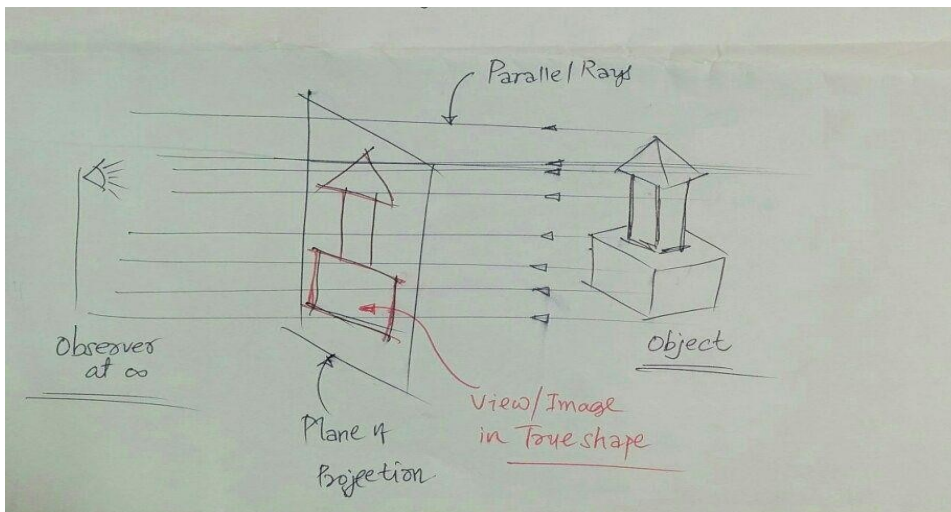


Figure-2



Here the distance between observer & the object is finite. When the light falls on the object. It gets reflected Rays pass through the lens & falls on the retina forms an image which is perceived by brain.

Our concern is what happens in between observer & object. Place an imaginary vertical (can be horizontal also) plane. The plane of projection in between them. These projectors/ visual rays pierces the plane at different points. When these points are joined... an image/ view is formed. This view (on Vertical Plane) is distorted. Distortion varies as per the position of the plane of projection. It's more nearer the observer & less nearer the object.

This distortion is not required in Engineering Drawing & but may be useful in artistic renderings. This projection is called Perspective Projection. Architects use this for visualization. It is as seen by human eyes. Perspective is a pre- requisite. Now let's make one change. Put observer at infinite distance. Everything dramatically change over here. Rays keep on traveling to find the eyes of the observer. Means they never converge but run parallel to each other. This gets the name parallel projection. Now keep a plane in between anywhere get the view. This will be in TRUE shape & size. The view on vertical plane is called front view. If we obtain it on a horizontal plane then it's called top view. On a side plane/profile, Side view/profile view.

In the orthographic views all surfaces which are parallel to plane of projection form true shapes & others will not be in TRUE shape. Basically one view will not be sufficient to define the object in question so multiple views are drawn. That's why it's called multi view drawing! Meant for 2D Drawings.

In case of Perspective projection we get the feeling of 3D (object) on a 2D (plane of projection). So it's called 2 1/2D projection. It gives you an illusion of 3D on a 2D plane.

Which include Isometric. This is one of the three types of axonometric projections.

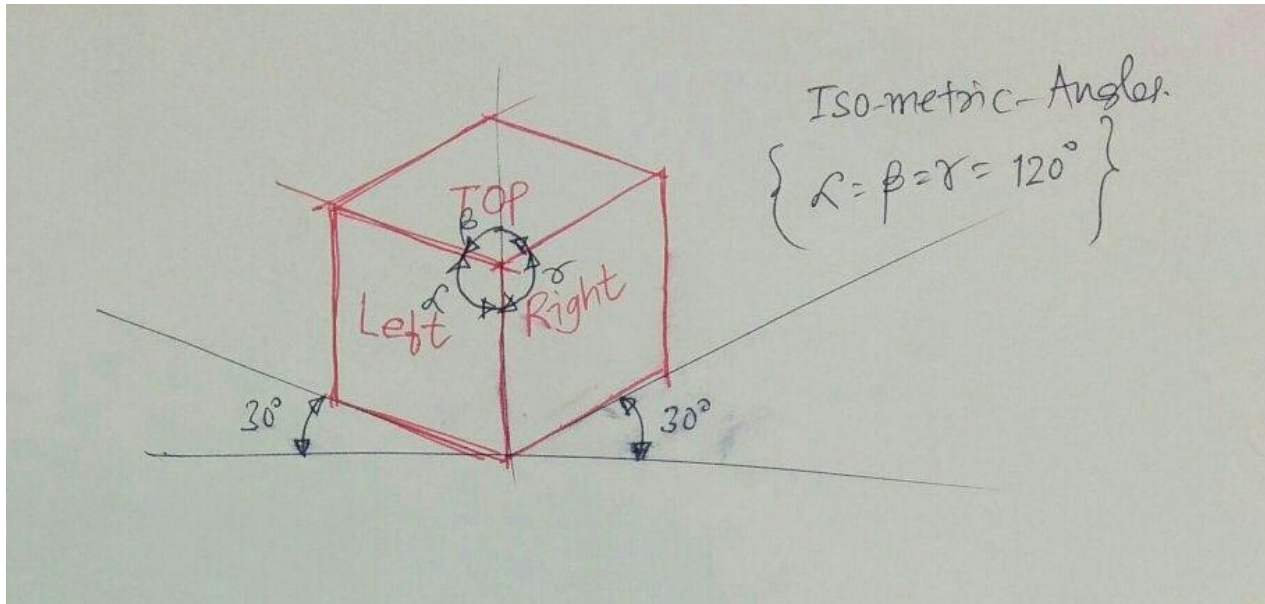
### **Isometric Projection:**

An isometric drawing is meant to depict a 3D image of an object in what appears to be a perspective view. However, similar to an orthographic perspective, all of the lines in an isometric drawing can be measured to their true length. What makes it different from an orthographic perspective is that its angled lines are drawn at 30 or 60 degrees or divisions of them. Drawing this by hand we would use a 30/60/90 triangle.

In either case, both types of perspectives can be accurately measured with a ruler in order to know the objects measurements.

To understand this consider a cube resting on one of its corner in such a way the three mutually perpendicular planes/surfaces of cube are equally inclined to the plane of projection.

Figure-3.



Here you can see three faces of a cube. Left, top & right. Isometric projection of any object can be done with these 3 ISO planes. All measured angles are all equal to 120 degrees. That's similar (ISO) angles metric (measurements).

So view is distorted but a pictorial one. Normally created using a scale called Isometric Scale & this is called as Isometric Projection. If done to true dimensions then it's called Isometric Drawing/View.

**Q2: What is orthographic projection? Write its types in detail?**

**Ans: Orthographic projection:**

Basically, Orthographic projection could be defined as any single projection made by dropping perpendiculars to a plane. In short, orthographic projection is the method of representing the exact shape of an object by dropping perpendiculars from two or more sides of the object to planes, generally at right angles to each other; collectively, the views on these planes describe the object completely. Descriptive geometry is basically the use of orthographic projection in order to solve

for advanced technical data involving the spatial relationship of points, lines, planes, and solid shapes.

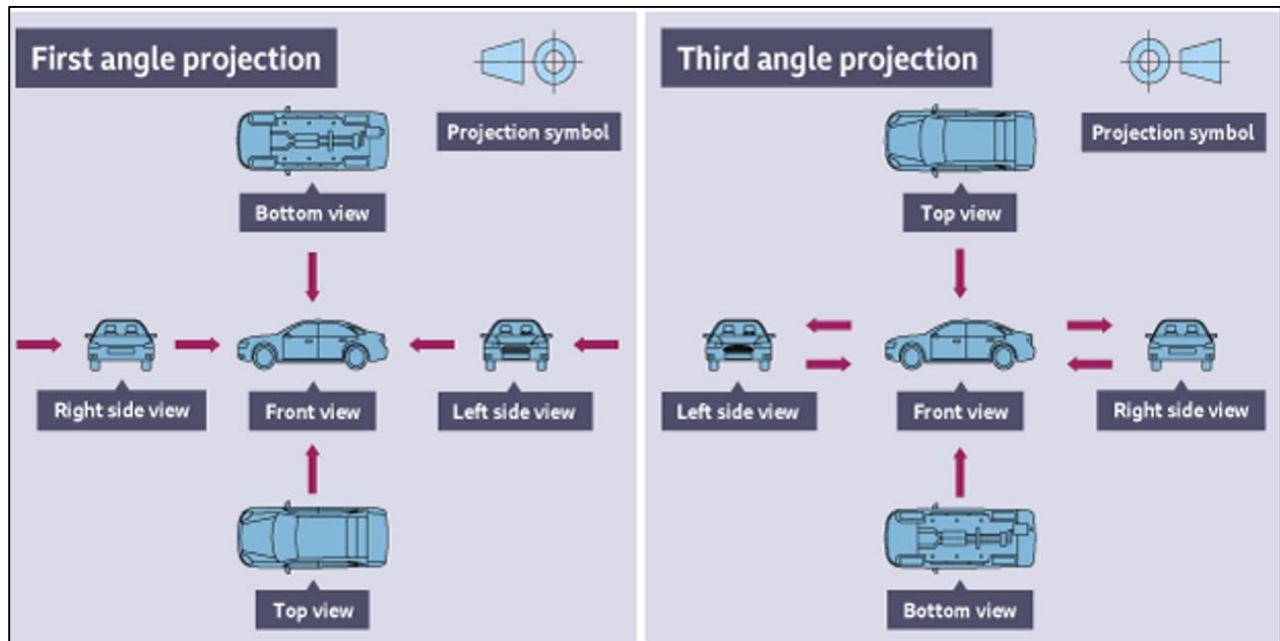
**Types of orthographic projection:**

Basically, there are 2 types of orthographic projection. They are:

- 1) 1st angle projection and
- 2) 3rd angle projection

First angle projections and third angle projections are the two main types of orthographic drawing, also referred to as ‘working drawings’. The difference between first and third angle projection is in the position of the plan, front and side views.

In third angle, what you see from the right would be drawn on the right. In first angle, the view from the right would be projected through and drawn on the left. The views in first angle are depicted as if you were looking at an x-ray of the object.



In a first angle projection the plan view is below the side view. In a third angle projection the plan view is above the side view.

**Q3:** What do you know about the Sectional view of solids? Write in detail?

**Ans: Sectional View of Solids:**

The hidden or internal parts of an object are shown by sectional views in technical drawings. The sectional view of an object is obtained by cutting through the object by a Suitable plane known as the section plane or cutting plane and removing the portion lying between the plane and the observer. The surface produced by cutting the object is called the section and its projection is called a sectional plan or sectional elevation. The section is indicated by thin section lines uniformly spaced and inclined at  $45^\circ$ .

- A sectional view of an object is obtained by projecting the retained portion of the object which is left behind when object is cut by an imaginary section plane and the portion of the object between the section plane and the observer is assumed as removed.
- The object is cut by a section plane AA. The front half of the object between the Section plane and the observer are removed. The view of the retained portion of the object is projection VP. The top view is projected for the whole uncut object.

**Types of sectional views of solids:**

By using the two different types of perpendicular section planes we obtain the following 2 types of sectional views of solids:

- Section of solids obtained by horizontal planes
  - Section of solids obtained by vertical plane
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