

**INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY**  
**Department of Mechanical Engineering**

ME-119 Engineering Drawing & Graphics

2014-15 Semester I

**Sheet 7: Sections of Solids**

Note:

- Practice all problems roughly before coming to the Drawing Session. For more details of the exercises in this sheet, refer Chapter 14 of the textbook (N. D. Bhatt, Engineering Drawing, 50<sup>th</sup> Ed.).

**PRISMS:**

1. A hollow square prism, base 50 mm side (outside), length 75 mm and thickness 9 mm is lying on the H.P. on one of its rectangular faces, with the axis inclined at  $30^\circ$  to the V.P. A section plane, parallel to the V.P. cuts the prism, intersecting the axis at a point 25 mm from one of its ends. Draw the top view and sectional front view of the prism.
2. A hexagonal prism, side of the base 25 mm long and axis 65 mm long is resting on a base edge on the H.P., its axis being inclined at  $60^\circ$  to the H.P. and parallel to V.P. A section plane, inclined at  $45^\circ$  to the V.P. and normal to the H.P., cuts the prism and passes through a point on the axis at a distance of 20 mm from the top end of the axis. Draw its sectional front view and true shape of the section.
3. An equilateral triangular prism, base 50 mm side and height 100 mm is standing on the H.P. on its triangular face with one of the sides of that face inclined at  $90^\circ$  to the V.P. It is cut by an inclined plane in such a way that the true shape of the section is a trapezium of 50 mm and 12 mm parallel sides. Draw the projection and true shape of the section and find the angle, which the cutting plane makes with the H.P.
4. A cube of 25 mm edge rests on one of its corners on the H.P. so that a solid diagonal is vertical and two of its faces are perpendicular to the V.P. A vertical section plane parallel to the V.P. cuts the cube at a distance of 8 mm from the solid diagonal and nearer to the V.P. Draw its sectional front view.
5. A cylinder 75 mm diameter and 125 mm long is placed on the frustum of a cone (base diameter 100 mm, top diameter 50 mm and height 125 mm). The frustum is resting with its base on the Horizontal plane while the cylinder has its axis parallel to both planes and is placed symmetrically on the frustum such that its axis cuts the axis of the cone at a right angle. Both the solids are cut by a vertical section plane, the HT of which is 12 mm from the axis of the frustum and makes an angle of 30 degrees with xy. Draw the sectional front view and true shape of the sections.
6. A cube of 65 mm long edges has its vertical faces equally inclined to the VP. It is cut by a section plane, perpendicular to the VP, so that the true shape of the section is a regular hexagon. Determine the inclination of the cutting plane with the HP and draw the sectional top view and true shape of the section.

**CONES:**

7. A cone with a base diameter of 70 mm and a height of 80 mm is placed co- axially on a circular disc with a diameter of 120 mm and thickness of 35 mm. An auxiliary horizontal plane cuts the combination of solids such that the cone axis is bisected. The plane passes tangential to the base circle of the cone. Draw the projections and obtain the true shape of the sectioned part of the combination.
8. A cone, base 65 mm diameter and axis 75 mm long, is lying on the H.P. on one of its generators with axis parallel to the V.P. A section plane, which is parallel to the V.P. cuts the cone 6 mm away from the axis. Draw the sectional front view.

## **PYRAMIDS:**

9. A hexagonal pyramid, base 30 mm side and axis 70 mm long is resting on its slant edge of the face on the horizontal plane. A section plane, perpendicular to the V.P., inclined to the H.P. passes through the highest corner of the base and intersecting the axis at 25 mm from the base. Draw the projections of the solid and determine the inclination of the section plane with the H.P.

10. A pentagonal pyramid, edge of base 25 mm long and height 50 mm is resting on the H.P. on a corner of its base in such a way that the slant edge containing that corner makes an angle of  $60^\circ$  with the H.P. and is parallel to the V.P. It is cut by a section plane making an angle of  $30^\circ$  with the V.P., perpendicular to the H.P. and passing through a point on the axis at a distance of 6 mm from its base. Draw its sectional front view and true shape of the section.

11. A tetrahedron with 70 mm long edges rests on its face on the HP with a side of that face perpendicular to the VP. The solid is cut by an auxiliary horizontal plane in such a way that the true shape of the section is a trapezoid of parallel sides 40 mm and 18 mm. Draw the elevation and sectional plan. Find the inclination of the cutting plane with the HP. Also, draw the auxiliary view showing the true shape of the section.

## **FRUSTRUMS:**

12. A frustum of a cone, base 75 mm diameter, top 50 mm diameter and axis 75 mm long, has a hole of 30 mm diameter drilled centrally through its flat faces. It is resting on its base on the ground and is cut by a section plane, the VT of which makes an angle of 60 degrees with xy and bisects the axis. Draw its sectional top view and an auxiliary top view on a reference line parallel to the VT, showing clearly the shape of the section.

13. Consider a frustum of a cone, with base diameter 100 mm, top diameter of 50 mm and axis height 50 mm. A hemisphere of diameter 50 mm is sitting on the top face of the frustum with its flat face on the top face. The axis of the cone is parallel to H.P. as well as V.P. A plane perpendicular to H.P. and parallel to a cone generator cuts the combined solid in such a way that the cutting plane bisects the radial line of the hemisphere, which coincides with the cone axis. Draw the front and top views. Show the true shape of the section of the larger part of the combined solid.