

Unit:3- Projections of SolidsTheory Questions

1. Give a detailed classification of solids.

A. Solids are 3 dimensional objects defined by length, breadth and height. Solids may be divided into two main groups: Polyhedra and Solids of revolutions. In polyhedra, the solids are bounded by planes called faces. E.g. Prisms, pyramids, frustums, truncated solids, etc. In solids of revolution, a polygonal shape (rectangle, triangle, semi circle, etc) is revolved about a fixed side to generate the required solid. Eg. Cylinders, cones and spheres.

2. What is meant by polyhedron? Give examples.

A. A polyhedron is a solid bounded by planes, which are called as faces. A prism has rectangular faces and a pyramid has triangular faces. Eg. Polyhedra are prisms, pyramids.

3. What is meant by regular polyhedra? Give examples.

A. When all faces of the polyhedra are equal and regular, it is called as regular polyhedra. E.g. Cube (hexahedron), tetrahedron, icosahedrons, etc.

4. State the number of faces and shape of the face for (i) tetrahedron; (ii) Hexahedron; (iii) octahedron; (v) dodecahedron; (vi) Icosahedron

A: tetra-4 equilateral triangles; hexa- 6 squares(cube); octa-8 equilateral triangles; dodeca- 12 pentagons; icosahedron-20 equilateral triangles

5. What are solids of revolution? Give three examples and their formation

A. Solids of revolutions are solids obtained by revolving a polygon about a fixed side. There are 3 solids of revolutions, namely, cylinder, cone and sphere.

A cylinder is obtained by revolving a rectangle about one of its sides which remains fixed.

A cone is obtained by revolving a right angle triangle about one of its perpendicular sides which is fixed.

A sphere is obtained by revolving a semi circle about its diameter as its axis.

6. Define frustum and truncated solid.

A. When a pyramid or cone is cut by a section plane parallel to its base, removing the top portion, the remaining portion is called its frustum.

When a solid is cut by a plane inclined to its base, removing the top portion, the remaining portion is called as its truncated part.

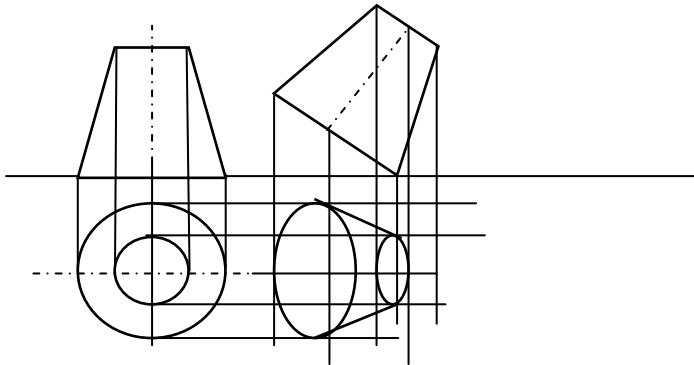
7. A _____ is a solid bounded by planes called _____ which meet in straight lines called _____. (Ans: Prism; faces; edges)

8. What are the ways to determine the visibility of an edge while drawing the projection of solids?

A. To determine the visibility of an edge while drawing, first give labelling to the base sides of the polygon. Then the edges along the labelled corners which are farther away from the HP/VP will be visible and the edges along the labelled corners nearer to the HP/VP will be invisible.

9. Name the solid whose projection in any position on to a plane is identical. Also name the shape of the projection. (Ans: Sphere; circle).

10. The top view of a frustum of a right circular cone resting on HP is concentric circles of 50 mm and 20 mm diameter. Sketch the front view when the generators are inclined at 45° .

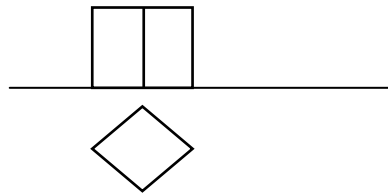


Problems:

Short Answer questions (Single stage Problems)

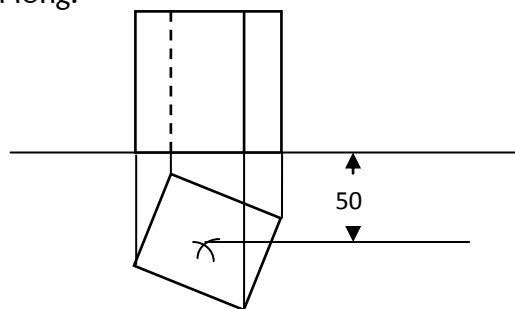
11. Sketch projections of a cube of 40 mm side, resting on H.P such that its vertical faces equally inclined to V.P.

A.



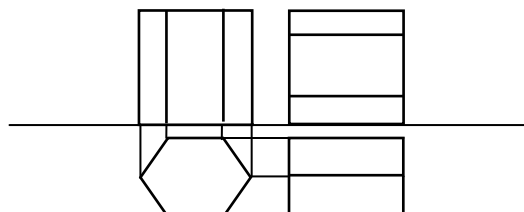
12. A square prism has its base on the ground and a side of base inclined at 30° to the VP and the axis is 50 mm in front of VP. Draw the projections taking a side of the base 30 mm long and axis 75 mm long.

A.



13. A right regular hexagonal prism, edge of base 20 mm and length 55 mm, lies on one of its rectangular faces such that its axis is parallel to both HP and VP Draw its projections when it is in first quadrant.

A.



14. Draw projections of a pentagonal prism, edge of base 30mm and 50mm long, having one of its base edges perpendicular to VP.
15. A right regular hexagonal prism edge of base 22 mm and 60 mm long lies on its rectangular face on the ground plane with the axis perpendicular to VP. Draw its projections.
16. A right regular pentagonal pyramid, edge of base 20 mm and height 45 mm, has its base parallel to VP with one of its base edges in HP. Draw its projections.
17. A right regular pentagonal prism of base 20 mm sides and axis 50 mm rests on its base on HP with one of its base edges perpendicular to the VP. Draw its projections.
18. A square prism of base 40 mm is resting on HP with its base sides equally inclined to both H.P and V.P and its axis inclined at 45° to H.P. Draw its projections.

Long Answer Problems (two stage problems) (Refer Solutions)

Case 1: Problems based on Axis inclined to HP or VP

19. A cylinder of diameter 50 mm and axis 75 mm long rests on one of the points of the base in HP and its axis parallel to VP and inclined to HP at 30° . Draw its projections.
20. A cylindrical prism of 50 mm diameter and 70 mm long has its axis parallel to H.P, and inclined at 30° with V.P. Draw its projections.
21. A right circular cone of 30 mm diameter base & axis 50 mm long is resting on a point of base circle on HP with the axis inclined at 45° to the HP & parallel to the VP. Draw its projections.
22. A hexagonal prism of base 30 mm & axis 50 mm has a rectangular face on the HP & its axis makes an angle of 60° with the VP. Draw its projections.
23. A hexagonal pyramid of base 40 mm sides and axis 70 mm long is resting on HP on one of its base edges. Its axis is inclined at 30° with the HP and parallel to VP. Draw its projections.
24. A pentagonal prism of base 25 mm side and axis 50 mm long is resting on one of its rectangular faces on the HP with its axis inclined at 45° to the VP. Draw its projections.

Case 2: One of the Faces / Generators lying on HP/VP (Refer Solutions)

*****A triangular face is for pyramid and rectangular face is for prism.

25. A right regular pentagonal pyramid, edge of base 30 mm and 68mm high, is lying on one of its triangular faces on ground plane (HP) such that its axis is parallel to VP. Draw its projections.
26. A cylinder of base diameter 40 mm and axis 70 mm long is resting on HP on one of its generators with the axis parallel to both HP and VP. Draw its projections.
27. A right regular pentagonal pyramid, edge of base 30 mm and 68mm high, is lying on one of its triangular faces on VP such that its axis is parallel to HP. Draw its projections.
28. A cone of base 50 mm diameter & axis 80 mm long is lying on one of its generators on the HP with the axis parallel to the VP. Draw its projections.
29. A square pyramid, edge of base 40 mm and axis 70 mm long is resting on HP on one of its triangular faces with the axis parallel to VP. Draw its projections.
30. A square pyramid, edge of base 40 mm and axis 70 mm long is resting on HP on one of its slant edges with the axis parallel to VP. Draw its projections.
31. A hexagonal pyramid, edge of base 40 mm and axis 70 mm long is resting on HP on one of its triangular faces with its axis parallel to VP. Draw its projections.
32. A hexagonal pyramid, edge of base 40 mm and axis 70 mm long is resting on HP on one of its slant edges with the axis parallel to VP. Draw its projections.

Case 3: Problems with Solids inclined to both HP and VP (Refer Solutions)

33. A cone of 50 mm diameter and 70 mm long axis rests on one of the points of its base in HP. The axis of the cone is inclined at 45° to HP and 30° to VP. Draw its projections.
34. A cone of base 40 mm diameter & axis 60 mm long is resting on one of its generators on the HP & the axis makes an angle of 30° with the VP. Draw its projections
35. Draw 3 views of a cone having base 50 mm diameter & axis 75 mm long, having one of its generators in the VP & inclined at 30° to the HP, the apex being in the HP.
36. An equilateral triangular pyramid of base side 40 mm and axis 65 mm rests in HP on one of its base sides. Draw the projections if the axis makes 25° and 40° with the HP and VP respectively.
37. A hexagonal pyramid side of base 25mm and axis height 60mm long has an edge of the base on the ground. Its axis is inclined at 30° to the ground and 45° to the VP. Draw its projections.
38. A hexagonal pyramid, edge of base 30 mm and height 70 mm lies on one of its triangular faces on the HP. The center line of the triangular face (axis) is making an angle of 45° to the VP. Its vertex is 5 mm in front of VP. Draw the front and top views of the pyramid.
39. A pentagonal pyramid, base 25 mm side & axis 50 mm long has one of its triangular faces on the VP & the edge of the base contained by that face makes an angle of 30° with the HP. Draw its projections. (Refer Prob No.13.20 in text book)
40. A square pyramid of 50 mm side and 80 mm long axis is placed on the ground on one of its slant edges such that the apex is in VP and the slant edge makes an inclination of 45° with V.P. Draw projections of this solid. (3 stage problem)
41. A right regular pentagonal prism, side of base 30 mm and height 70 mm rests on one of its base corners on HP such that its long edge containing the corner is inclined at 55° to the HP and the side of the base, opposite to the corner is inclined at 30° to the VP. Draw its projections keeping the vertex towards the VP.
42. A regular pentagonal pyramid with the sides of its base 30 mm & height 80 mm rests on an edge of its base on the HP. The base is tilted until its apex is 50 mm above the level of the edge of the base on which it rests. Draw the projection of the pyramid when the edge on which it rests is parallel to the VP & the apex of the pyramid points towards the VP. **(Solution: Refer Prob 13.31 in text book ND Bhat under projection of solids)**
43. A thin lamp shade in the form of a frustum of a cone has its larger end 150 mm diameter, smaller end 75 mm diameter & height 100 mm. Draw its three views when it is lying on its side on the ground & the axis parallel to the vertical plane.
44. A 66 mm diameter spherical paper-weight has a 44 mm diameter flat base. It is placed on HP such that its flat base is perpendicular to the HP and inclined to VP at 36° . Draw its projections.