INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY
Department of Mechanical Engineering

ME-119 Engineering Drawing & Graphics *2014-15 Autumn Semester*

Sheet 9: Intersection of Surfaces

Note:

- *Practice all problems roughly before coming to the Drawing Session. For more details of the exercises in this sheet, refer Chapter 16 of the textbook (N. D. Bhatt, Engineering Drawing, 50th Ed.).*

- ***Totally 4 figures to be drawn (3 from the first 10 and 1 from 11-13)***

Three randomly chosen problems from Problems 1 to 10.

1. A square prism (base side = 60 mm, height = 100 mm) stands on its square base in HP such that all faces are equally inclined to VP. A horizontal square prism (base side = 35 mm, axis length = 120 mm) penetrates the vertical prism. The axis of the horizontal prism is parallel to both VP and HP, and is 12 mm away from the mid-point of the axis of the vertical prism. A lateral face of the horizontal prism makes 30 degrees with the HP. Draw the projections of top view, front view and the left side view.

2. A hexagonal pyramid (base side = 40 mm, height = 90 mm) is resting on the HP on its base with two opposite sides of the base parallel to the VP. A square prism (base side = 35 mm, length = 100 mm) intersects it such that the axis of the prism is perpendicular to VP and faces are equally inclined to HP. The two axes intersect at a point 35 mm from the base of the pyramid. Draw three views of the assembly and **show the line of intersection clearly in the top and side views**.

3. A pentagonal prism (50 mm base side and 80 mm height) stands on the ground on its base. A vertical face of the prism is parallel to the VP and nearer to the observer. A horizontal cylinder (diameter = 60 mm, length = 100 mm) intersects it, with axis parallel to VP and bisecting the axis of the prism at right angles. Draw three projections and **show the curve of intersection**.

4. A cone (80 mm diameter and 80 mm height) is resting on one of its generators on the HP. A square prism (side 24 mm, height 100 mm) passes vertically through it and lies on its square face (on the HP), such that the axis of the prism intersects the axis of the cone at the midpoint (of the cone). The faces of the prism are equally inclined to the VP. Draw three projections and **show the intersection curve**.

5. A triangular prism of 60 mm base side and 100 mm length penetrates a sphere of diameter 80 mm. A lateral face of the prism is parallel to the HP and the edge opposite to that face passes through the uppermost point of the sphere. The axis of the prism is perpendicular to the VP. The prism comes out equally from both sides of the sphere. Draw the projections and **show the curve of intersection**.

6. A triangular pyramid (64 mm base side and 80 mm height) is resting on the ground with one base edge parallel to VP (and closer to it). A cylinder of 36 mm diameter and 90 mm length passes through the pyramid. The axis of the cylinder is parallel to the axis of the pyramid, but 10 mm away from it (closer to VP). Draw the necessary views and **show the curve of intersection.**

7. A square pyramid (40 mm base, 64 mm height) is resting on its base on the HP, with all base edges equally inclined to the VP. A cone (base diameter = 40 mm, height = 70 mm) pierces into the pyramid such that the axis of the cone is parallel to both HP and VP and its midpoint intersects the midpoint of the pyramid axis at right angles. The cone is then removed so that only the hole remains in the pyramid. Draw three views of the pyramid and **show the shape of the hole in each view**.

8. A square pyramid (45 mm base, 60 mm height) has its base parallel to the HP. All sides of the base are equally inclined to the VP. A sphere of diameter 40 mm partially penetrates the pyramid such that the center of the sphere is at the midpoint of the slant edge (right side) parallel to the VP. The sphere is then removed and the depression created by the sphere remains. Draw the three views of the pyramid.

9. Two cylinders of diameter 60 mm and length 120 mm intersect each other. One of the cylinders is vertical with base resting on the ground while the other cylinder is horizontal. An extreme generator of each cylinder passes through the mid-point of the other cylinder's axis. Draw the three views of the cylinders.

10. A vertical cone (80 mm base diameter and 100 mm height) is penetrated by a horizontal cylinder with a diameter of 45 mm and length 100 mm. The axis of the cylinder is 30 mm above the base of the cone, parallel to the VP and is 5 mm away from the axis of the cone. Draw three views **showing the curve of intersection**.

<u>One problem chosen from 11 to 13</u>

11. A cone (base diameter = 100 mm, height = 125 mm) is kept with its base on the ground. Another cone (base diameter = 50 mm, height = 100 mm) pierces it. The axis of the second cone is parallel to both HP and VP; it is 6 mm away from the axis of the vertical cone and is 40 mm above the base of the vertical cone. Equal amounts of the axis of the horizontal cone come out on either side of the vertical cone. Draw the top, front and left side views.

12. A cone (base diameter =70 mm, height = 80 mm) is intersected by a sphere of diameter 70 mm. The center of the sphere is 40 mm from the base and 22 mm from the axis of the cone. The plane containing the center of the sphere and the axis of the cone is parallel to the VP. Draw three views of the solids.

13. Two cones equal in all respects (base diameter = 60 mm, height = 80 mm) intersect each other. The apex of one cone touches the base of the other. The axes are parallel and 15 mm apart. The plane containing the axes is parallel to the VP. Draw the three views of the cones **showing the curve of intersection**.