5. In the SV, the vertical edges $a''a''$ and $c''c''$ intersect with the faces $1''2''$ and $2''3''$ of the cylinder at p_a'', q_a'', p_c'' and q_c''. Project these points to FV upto vertical edges $a'a'$ and $c'c'$.
6. Join points $p_1'p_2'p_3'p_4'p_5'q_a'p_7'$ and $p_c'q_1'q_2'q_2'q_2'q_2'q_2'q_2'q_2'q_c'$ by dotted lines and then $p_1'p_{12}'p_{11}'p_{10}'p_9'p_8'p_7'$ and $p_c'q_{12}'q_{11}'q_{10}'q_9'q_8'q_7'$ by full lines as shown. These lines show the curve of intersection.
7. Show the portion of the cylinder which is inside the prism by dotted lines in both the FV and TV.

14.6 INTERSECTION OF CYLINDER BY ANOTHER SOLID

When a cylinder is penetrated by any other solid, the intersection of their surfaces will be along a curve or curves. As no solid edges are present in a cylinder, a number of generators are required to obtain points of intersection and, thereby, the curve of intersection. Sometimes it is required to have some more critical intersection points, commonly known as key points, where the curve makes change in direction. To obtain a smooth curve of intersection, all the point of intersection and critical intersection points are joined together in a proper sequence. For solving such problems on intersection of surfaces, generally the cutting plane method is more convenient.

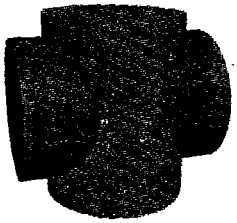

Fig. 14.7(a)

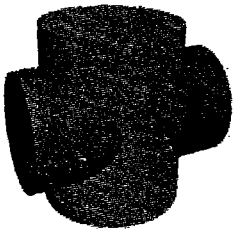

Fig. 14.7(b)

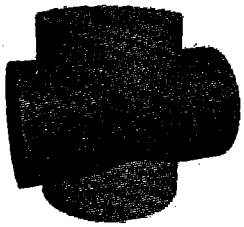

Fig. 14.7(c)

PROBLEM 14.6 (FIG. 14.8) *A cylinder with a 70 mm base diameter is resting on its base on the H.P. It is penetrated by another cylinder of 60 mm base diameter, such that their axes intersect each other at right angles. Draw the projections of the combination and show the curves of intersection.*

CONSTRUCTION Figure 14.8

1. Draw a circle with a 70 mm diameter to represent TV of the vertical cylinder. Assuming its suitable height (say 100 mm), project FV and SV.
2. Draw a circle with a 60 mm diameter in the SV, the centre of

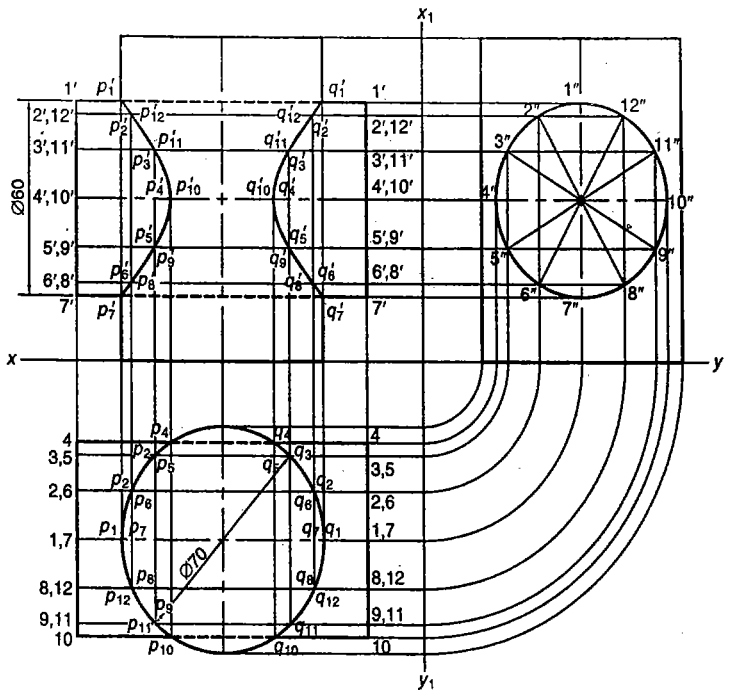

Fig. 14.8

principal planes and intersects the axis of the pyramid at a point 30 mm above the H.P. Draw the projections of the combination and show the curves of intersection.

CONSTRUCTION Figure 14.14

1. Draw three views of the square pyramid as usual.
2. Draw a circle with a 50 mm diameter, keeping the centre 30 mm above the base of the pyramid on its axis in the SV Project it to obtain FV and TV of the cylinder.
3. Mark 12 generators in all the three views of the cylinder.
4. Consider seven horizontal section planes, passing one by one through 1′, 2′12′, 3′11′, 4′10′, 5′9′, 6′8′ and 7′ to obtain the common points between section of square pyramid (which are squares) and section of cylinder (which are rectangles) in the TV.
5. Join these points in both the TV and FV to obtain the curve of intersection as shown.

14.8 INTERSECTION OF CONE BY ANOTHER SOLID

PROBLEM 14.13 (FIG. 14.15(A) AND (B)) *A cone with an 80 mm base diameter and a 100 mm long axis, is resting on its base on the H.P. It is completely penetrated by a cylinder with a 40 mm base diameter. The axes of the solids intersect each other at right angles, 30 mm above the base of the cone. Draw the projections of the combination and show curves of intersection.*

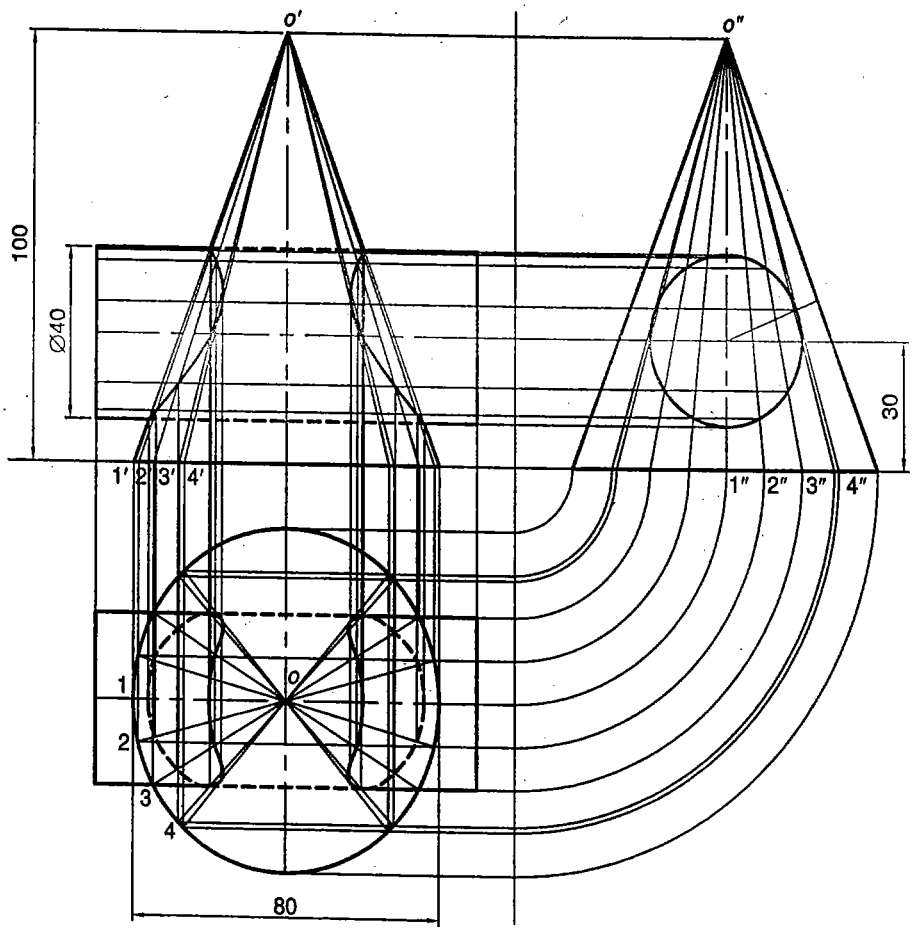

Fig. 14.15(a)

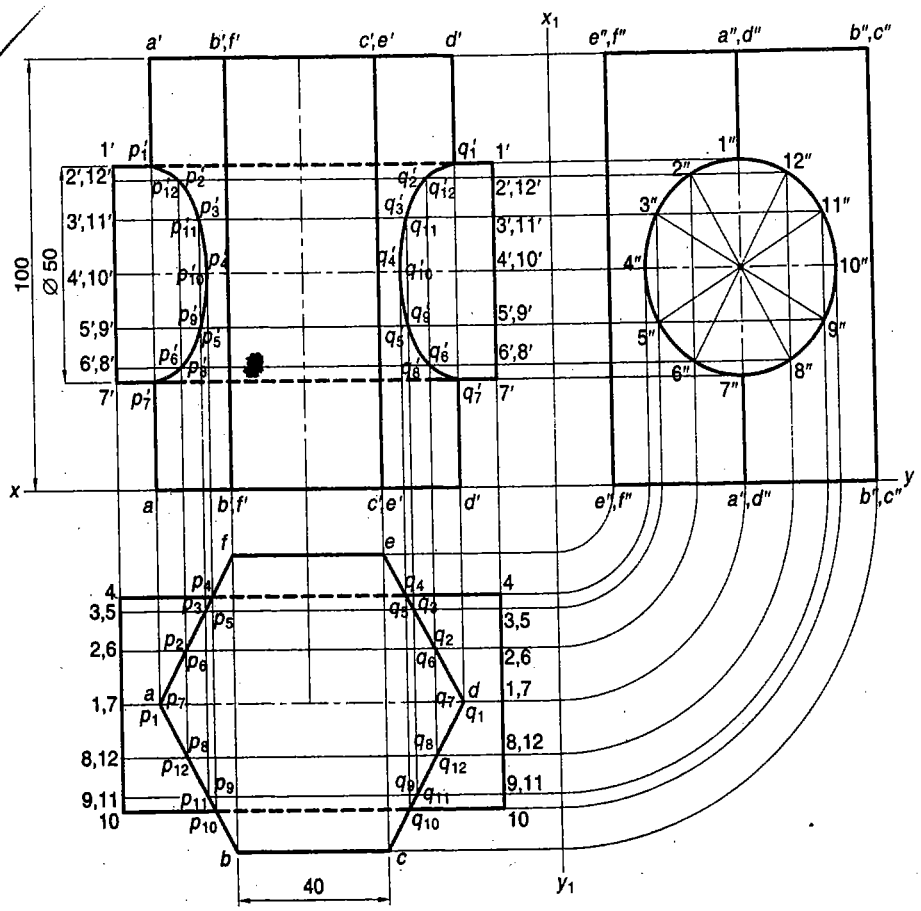

Fig. 14.24

4. Project points p_1, p_2, p_3, p_4, p_5, p_6, p_7, p_8, p_9, p_{10}, p_{11}, p_{12} to FV to meet their corresponding generators 1′, 2′, 3′, 4′, 5′, 6′, 7′, 8′, 9′, 10′, 11′, 12′ at points p_1', p_2', p_3', p_4', p_5', p_6', p_7', p_8', p_9', p_{10}', p_{11}', p_{12}'. Similarly project q_1, q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9, q_{10}, q_{11}, q_{12} to FV and obtain points q_1', q_2', q_3', q_4', q_5', q_6', q_7', q_8', q_9', q_{10}', q_{11}', q_{12}'.
5. Join points $p_1'p_2'p_3'p_4'p_5'p_6'p_7'$ and $q_1'q_2'q_3'q_4'q_5'q_6'q_7'$ by continuous lines as shown. These lines show the curves of intersection.

PROBLEM 14.23 (FIG. 14.25) *A square pyramid with a 70 mm base edge and a 100 mm long axis, is resting on its base on the H.P. with a side of base inclined at 30° to the V.P. A square prism with a 30 mm side having its axis parallel to both the principal planes is penetrated through it. The axes of the solids intersect each other at 30 mm above the base of the pyramid. Draw the projections showing the curves of intersection when rectangular faces of the prism are equally inclined to the H.P.*

CONSTRUCTION Figure 14.25

1. Draw three views of the square pyramid and the penetrating prism as usual.
2. Consider three horizontal section planes, passing one by one through 1′, 2′, 4′, 3′ and obtain the sections of the pyramid as squares in the top view.
3. Mark points which are common to the squares obtained in step 2 with the edges of the prism in the TV and project to their corresponding positions in the FV.

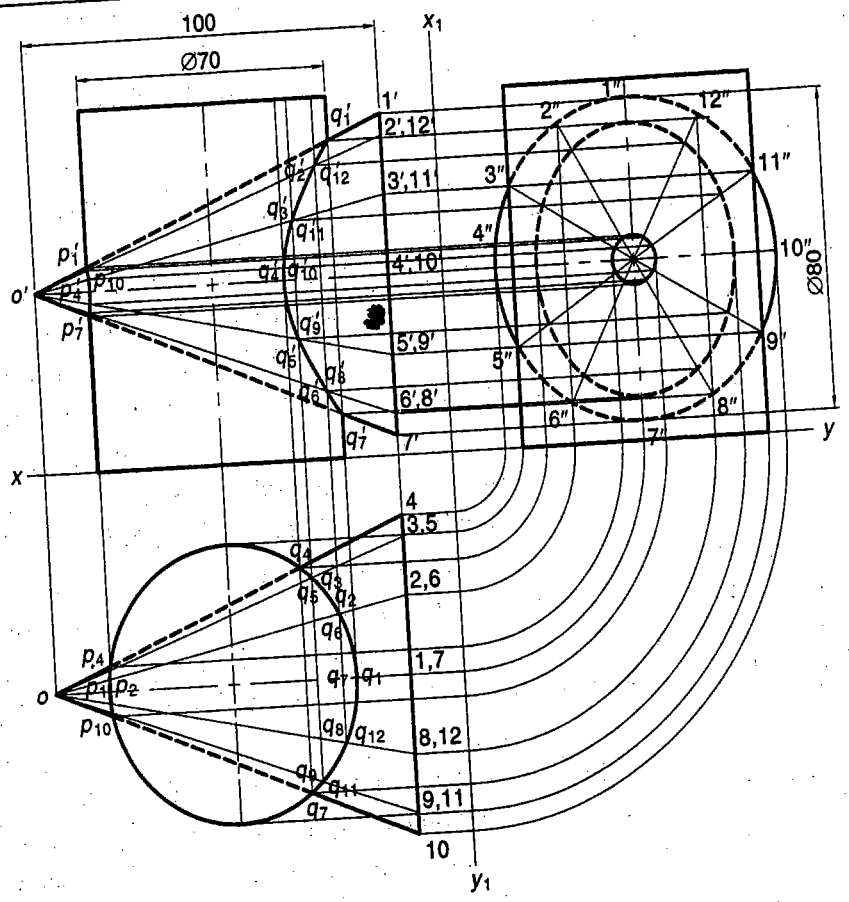

Fig. 14.26

6. Transfer these points to FV and SV at their respective positions and join them to get the desired curve of intersection in FV and SV.

Review Questions

1. What do you mean by key points? What is their significance in intersection of surfaces?
2. Name the methods of determining the curves of intersection.
3. Describe the conditions in which the curves of intersection between cylinder and cylinder is represented by straight lines.
4. Describe the conditions in which the curves of intersection between a cone and a cylinder is represented by straight lines.

Exercises

1. A hexagonal prism, having base with a 40 mm side and a 100 mm long axis, is resting on its base on the H.P. with a side of the base parallel to the V.P. It is penetrated by a square prism having base with a 35 mm side and a 100 mm long axis, such that the axes of both the prisms intersect each other at right angles. The faces of the square prism is equally inclined to the H.P. Draw the projections of the combination and show the lines of intersection.