

Indian Institute of Technology Bombay
Department of Mechanical Engineering

ME-119: ENGINEERING DRAWING

2014-15 Semester I

Sheet 4: Projections on Auxiliary Planes

Note:

Practice all problems roughly before coming to the Drawing Session. For more details of the exercises in this sheet, refer Chapter 11 of the text book (N. D. Bhatt, Engineering Drawing, 50th Ed.).

- (1) A line AB, 50mm long, has its end A in both H.P. and V.P. It is inclined at $\theta=30^\circ$ to H.P. and at $\phi=45^\circ$ to V.P. Draw its projections (a) using only front and top views and (b) using necessary auxiliary views.
- (2) A room is 4.8m x 4.2m x 3.6m high. Determine graphically the distance between a top corner and the bottom corner diagonally opposite to it (a) using only front and top views and (b) using necessary additional auxiliary views.
- (3) An equilateral triangular plate of 75mm side has an inscribing circle drawn in it. This plate is vertical and inclined at 30° to V.P. and one of its sides is inclined at 45° to H.P. Draw the projections of this plate.
- (4) A line AB is inclined to the HP and parallel to VP. The end A is 10 mm above HP and 25 mm in front of VP. The end B is 40 mm above the HP. Another line CD is inclined to the VP and parallel to the HP. The end C is 15 mm above the HP and 60 mm in front of VP. The end D is 10 mm in front of VP. Both the lines share common end projectors that are 50 mm apart. Draw the projections of the lines and find the shortest distance between them.
- (5) A line AB measures 95 mm. The projectors through its VT and the end A are 35 mm apart. The end A is 25 mm above the HP and 15 mm in front of the VP. The VT is 8 mm above the HP. Draw the projections of the line and determine the HT and inclinations of the line with the HP and the VP. Use auxiliary planes.
- (6) The end A of a line AB is 20 mm above the HP and 20 mm behind the VP. The end B is 15 mm below the HP and 45 mm in front of the VP. Elevation of the line measures 70 mm. The point P is 25 mm above HP and 35 mm in front of VP. The projector through P lies between the projectors through A and B and at a distance of 25 mm from the projector through A. Draw the projections of the line and the point and find the shortest distance between them. Also draw the projections of the perpendicular from point P on the line AB.
- (7) Consider an apparent view abc that looks like an equilateral triangle of altitude 50 mm with ab in xy and c below it. abc' is an isosceles triangle of altitude 75 mm and c' is

above xy . Determine the true shape of the triangle ABC , of which abc is the top view and abc' is the front view.

- (8) A straight road joining two places, A and B, at a hill station is 1 km long. The road has an upward gradient of 15° with respect to A. An aerial view shows the road at 40° east of south. A tourist spot C, at the same level as A, is 500 m from A and seen at 50° east of south with respect to A. Draw the projections of the road. Find the shortest length of a new road connecting C with the existing road.
- (9) Draw $a'b'$ equal to 70 mm parallel to and 10 mm above XY . Draw ab inclined at 35° to XY . The point a is 15 mm below XY . Draw $c'd'$ equal to 25 mm and cd equal to 45 mm, both perpendicular to XY . The point d' is nearer to and 35 mm above XY , while c is nearer to and 15 mm below XY . The projector of $c'd'$ passes through the mid-point of $a'b'$. Find the shortest distance between the lines AB and CD if both of them are fully in the first quadrant.
- (10) Four poles of height 3m, 8m, 11m, and 16m are erected at the corners of a square plot of side 20 m. The shorter poles are at corners opposite each other. Find the shortest distance between the two ropes, each connecting the tops of poles at opposite corners.
- (11) Determine the true shape of the figure, the top view of which is a regular pentagon of 35 mm sides, having one side inclined at 30° to xy and whose front view is a straight line making an angle of 45° to xy .
- (12) An equilateral triangle ABC of side 75 mm has its side AB in V.P. and inclined at 60° to H.P. Its plane makes an angle of 45° with V.P. Draw its projections.
- (13) An isosceles triangle PQR having base PQ of 50 mm length and an altitude of 75 mm has its corners P, Q, and R respectively 25 mm, 50mm and 75 mm above the ground. Draw its projections.
- (14) A thin regular pentagonal plate of 60 mm side has one of its edges in H.P. and perpendicular to V.P. while its farthest corner is 60 mm above H.P. Draw the projections of the plate. Project another front view on an A.V.P. making an angle of 45° with the V.P.
- (15) A thin composite plate consists of a square of 70 mm side with an additional semi-circle constructed on CD as diameter. The side AB is vertical and the surface of the plate makes an angle of 45° with V.P. Draw its projections. Project another top view on an A.H.P. making an angle of 30° with the side AB .
- (16) A 60 degrees set-square of 125 mm longest side is so kept that the longest side is in H.P. making an angle of 30° with V.P. and the set-square itself inclined at 45° to H.P. Draw the projections of the set-square.
- (17) A planar plate is composed of an equilateral triangle ABC and a semi-circle on AC as diameter. The length of the side AB is 50 mm and is parallel to V.P. The corner

B is 20 mm behind V.P. and 15 mm below H.P. The plane of the figure is inclined at 45° to H.P. Draw the projections of this plate.

- (18) An equilateral triangle ABC having side as 50mm is suspended from a point O on the side AB 15 mm from A in such a way that the plane of the triangle makes an angle of 60° with V.P. The point O is 20 mm below H.P. and 40 mm behind V.P. Draw the projections of the triangle.
- (19) A hexagonal plate of side 40 mm is resting on a corner in V.P. with its surface making an angle of 30° with V.P. The front view of the diagonal passing through the corner is inclined at 45° to the line xy. Draw the projections of the hexagonal plate.
- (20) A rectangular plate of size 50 mm x 70 mm stands on one of its shorter edges in H.P. and is raised about this edge so that the top view becomes a square of 50 mm. Determine the inclination of the plate with the horizontal plane.