Unit II: Part 2- Projections of Lines

Theory Questions

1. What is meant by trace of a line?

A. It is defined as the extension of a given line to the reference plane (HP or VP) to which it is perpendicular or inclined. The line meets the HP or VP as a point. This point is called trace of a line.

2. Explain the terms horizontal trace (HT) and vertical trace (VT) for a line.

A. The point in which the line meets the HP when extended is called HT and the point in which the line meets the VP when extended is called as VT. HT and VT need not lie on HP and VP always. In case of lines inclined to both HP and VP, the HT and VT do not lie always on HP and VP.

3. Explain the method of determining a trace with simple sketches.

A. HT: Consider a line inclined to HP. Extend it to xy to get h. From h, drop a perpendicular on to TV to get HT.
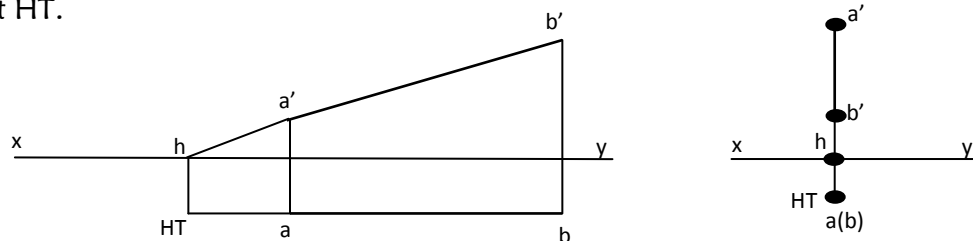
VT: Consider a line inclined to VP. Extend it to xy to get v. From v, drop a perpendicular on to FV to get VT.

4. When does a line have no traces?

A. (i): When a line is parallel to HP and VP, it has no traces.

   (ii) When a line is parallel to HP and inclined to VP, it has only VT and no HT.

   (iii) When a line is parallel to VP and inclined to HP, it has only HT and no VT.

   (iv) When a line is perpendicular to HP, its HT is its top view and it has no VT.

   (v) When a line is perpendicular to VP, its VT is its Front view and it has no HT.

5. When a line is parallel to a plane, its projection on that plane is equal to its _____. (straight line)

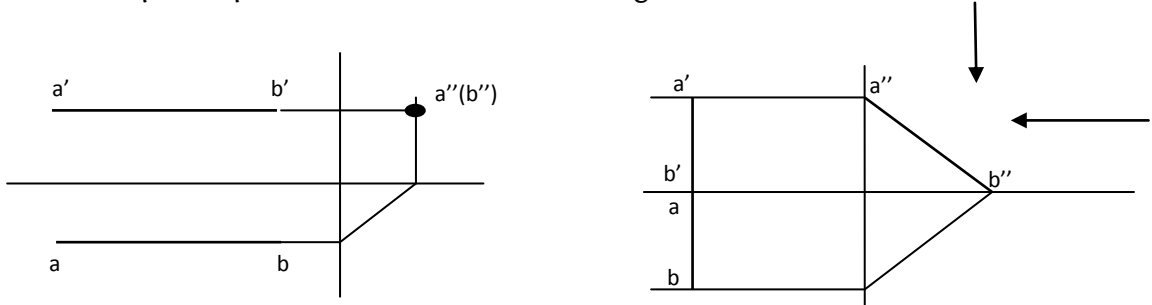6. When a line is perpendicular to a plane, its projection on that plane is a _____(Point).

7. (i) If a straight line is inclined to the VP & is in the HP, what is its front view & in which projection is the inclination of the line seen?

   (ii) If a straight line is inclined to the HP and is in the VP, what is its top view and in which view will the inclination of the line be seen?

A. (i) The front view is a reduced line ∥ to xy and the inclination of the line is seen in top view.

   (ii) The top view is a reduced line ∥ to xy and the inclination of the line is seen in Front view.

8. The projections of a straight line on to HP & VP are identical. Describe the position of the straight line & its projection on to a plane perpendicular to both HP & VP.

A. (i) The line is parallel to both HP and VP. The projection on the profile plane is a point.

(ii) The line is inclined at complimentary angles to HP and VP (sum of angles = 90^0). The projection on the profile plane will be the line at true angle to HP and VP.

9. A straight line AB of 40 mm long is contained by a profile plane, end A in HP, end B in VP. Draw its projections.
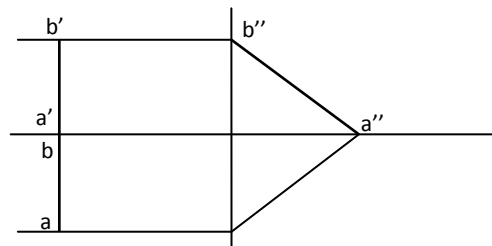
10. When a line is perpendicular to H.P. its _____ trace will coincide with _____ view. (HT, TV)

11. When a line is perpendicular to VP, its ___ trace will coincide with _____ view. (VT, FV)

Problems:
*Part-1: Short Answer problems*

12. Draw the projections of a straight line AB, of 50 mm length for the following positions:
    (i) Parallel to & 20 mm above HP & on VP.
    (ii) Parallel to both HP & VP & 20 mm from each.
    (iii) Perpendicular to HP, in the VP and its one end is 15 mm above the HP.
   (iv) Perpendicular to VP, in the HP and its one end is15 mm in front of the VP.
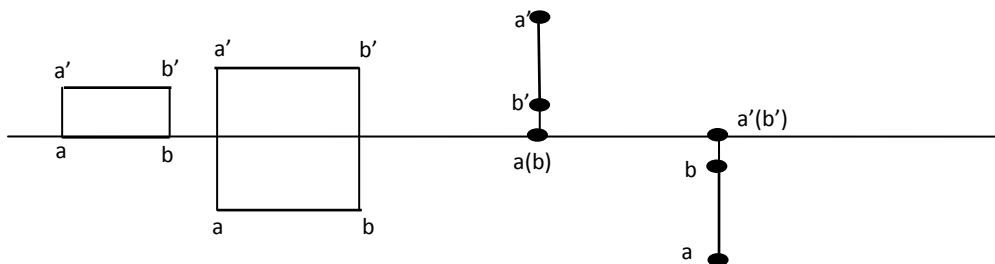
13. Draw the projections of a straight line AB of 60 mm length for the following positions:
    (i) Inclined to the HP at 35^0 and point A is in front of VP at 10 mm and 20 mm above HP.
    (ii) Inclined at 60^0 to the VP, having one end 20 mm above HP & 35 mm in front of VP.
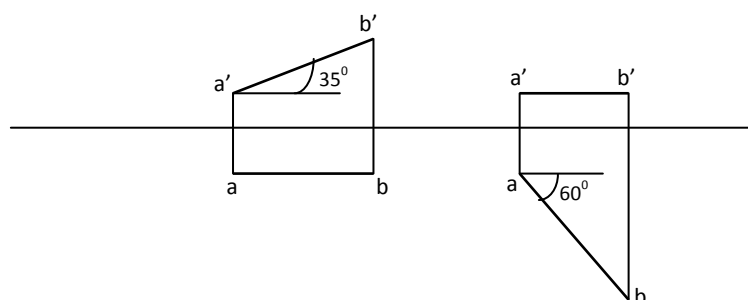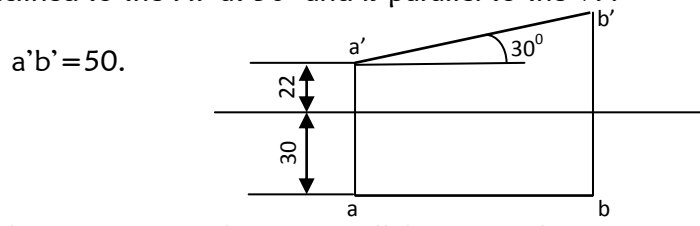
14. A line of 100 mm long is parallel to & 30 mm above HP. Its 2 ends are 25 mm and 50 mm in front of VP respectively. Find its inclinations with the VP.

(ab=100;oa=25;oa'=30)
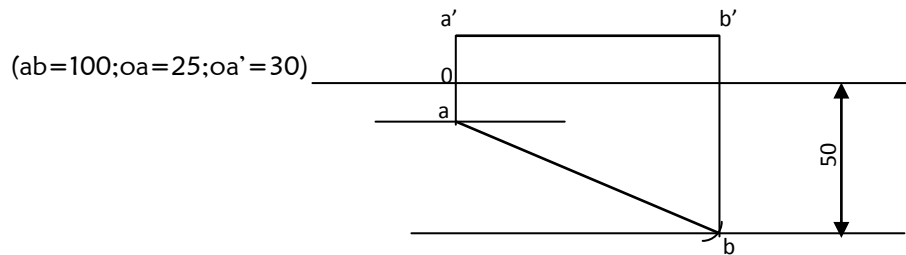
15. A line AB is 65 mm long and has its end A both in HP and VP. It is inclined at 45⁰ to the HP. Draw its projections.

a'b'=65.
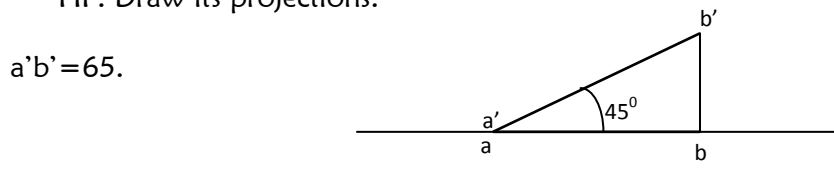
16. A line PQ, 50 mm long has its end P 22 mm from HP and 30 mm from VP. The whole line lies in one quadrant. Draw its projections in anyone of the four quadrants if it is inclined to the HP at 30° and is parallel to the VP.

a'b'=50.

17. A line AB, 60 mm long is parallel to HP & lies 20 mm above it. The point A is 30 mm & point B is 60 mm away from the reference axis. Draw the projections & traces of the line.

ab=60.
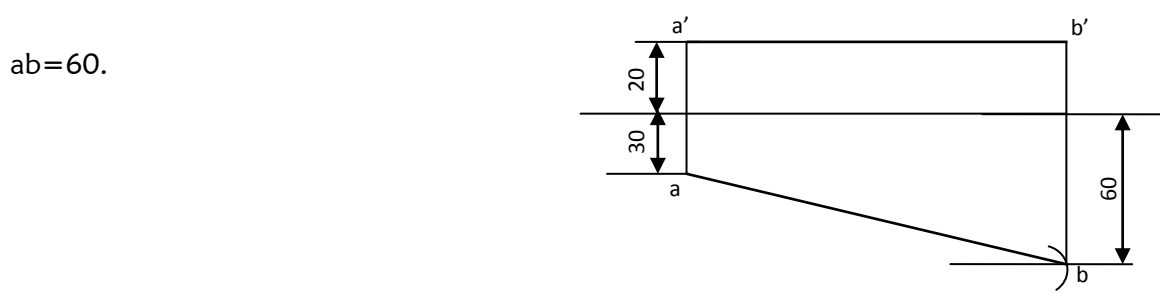
18. Two pegs fixed on a wall are 4.5 m apart. The distance between the pegs measured one parallel to the floor is 3.6 m. If one peg is 1.5m above the floor, find the height of the second peg and inclination of the line joining the two pegs, with the floor?

Use scale: 1: 100; find θ.
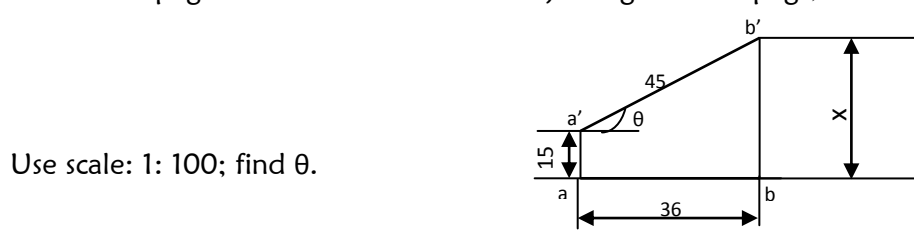
19. A straight line is parallel to both HP and VP. Its one end is 25 mm behind VP and 15 mm above HP. Length of the line is 10 cm. Draw its projections.
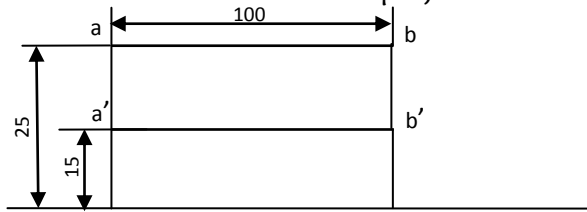
Part-2: Long Answer problems
(without data on traces; only location of HT, VT to be shown)
(for solutions, refer similar model problems in notes)

20. A line AB is 70 mm long. It is inclined at 45^0 to the HP. Its front view a'b' measures 50 mm. The end A is 15 mm above the HP and 20 mm in front of VP. The end B is in the first quadrant. Draw the projections of the line. Determine its inclination with VP and find its traces.

21. A line AB, 90 mm long, is inclined at 30^0 to the HP. Its end A is 12 mm above HP & 20 mm in front of VP. Its front view measures 65 mm. Draw the top view of AB & also find the traces of AB.

22. A line AB of 60 mm length is inclined to HP at 45^0 & inclined to VP at 30^0 with its end A at 40 mm above HP & 50 mm in front of VP. Draw the projections of the straight line AB & show its traces.

23. The top view of a 75 mm long line measures 65 mm and its front view measures 50 mm. Its one end is in the HP and 12 mm in front of VP. Draw its projections and find its inclination with HP and VP. Also locate its traces.

24. A line AB, 90 mm long, is inclined at 45^0 to the HP & its top view makes an angle of 60^0 with the VP. The end A is in the HP & 12 mm in front of the VP. Draw its front view & find its true inclination with the VP. Also locate its traces.

25. One end A of a straight line AB is 20mm above HP and 50 mm before (in front of) VP. The other end B is 70 mm above HP and 25 mm before VP (in front). The distance between the end projectors of the line is 60 mm. Draw the projections of the line and find the true length, true inclinations with HP and VP and the traces of the line.

26. A line AB 75 mm long, inclined at 45° to HP and 30° to VP. Its end B is in HP and 40 mm in front of VP Draw its projections

27. A line PO is in the first quadrant. Its ends P and 0 are 20 mm and 60 mm in front of the V.P respectively. The distance between the end projectors is 75 mm. The line is inclined at 30° to the V.P with its end 'P' in H.P. Draw the projections of PO and find its true length and the inclination with the H.P. Also locate its traces HT and VT.

Part-3: Long Answer problems (with data on traces using HT, VT,etc)

28. The front view of a line AB makes an angle of 30° with xy line. The HT of the line is 45 mm in front of VP while its VT is 30 mm below the HP. One end of the line A is 12 mm above the HP & the other end B is 115 mm in front of the VP. Draw the projections of the line & determine its true length & its inclinations with HP & VP. (Refer notes)

29. A line AB is in the 1st quadrant. Its ends A and B are 20 mm and 60 mm in front of VP respectively. The distance between the end projectors is 75 mm. The line is inclined at 30^0 to the HP and its HT is 10 mm above xy. Draw the projections of AB and find its true length and locate the VT. (Refer notes)