

# ENGINEERING DRAWING

## UNIT I - Part A

1. Solid Geometry is the study of graphic representation of solids of ----- dimensions on plane surfaces of ----- dimensions.
2. In the orthographic projection, the observer looks at the object from ----- distance.
3. In the first angle projection, the front view is drawn above the reference line. (True / False).
4. When a point lies in the second quadrant, it will be in front of VP and above HP. (True / False).
5. If a point is below HP and above VP, The top view is below XY. (True / False).
6. If both top view and front view is below XY, then the point lies in Fourth quadrant. (True / False).
7. Define Projection.
8. Define plane of projection
9. State the various types of projection.
10. Define Orthographic projection.
11. What do you mean by reference line or reference plane?
12. What do you understand by first angle projection?
13. Compare first angle projection with third angle projection.
14. Give the symbolic representation of first angle projection.
15. How do you draw the side view of an object?
16. A point is 'x' cm below HP and 'y' cm behind VP. State the position of the front and top views.
17. A point A, its plan is 20mm above xy line; the elevation 20mm below the xy line. State its quadrant.
18. A point B, its projections coincide with each other 40mm above xy line. State the quadrant.
19. What are projectors?
20. What is HP and VP?
21. Define Top View.
22. Define Front View.
23. Describe the position of an object in the four quadrants relative to their principal planes.
24. State the two methods of projection used.
25. The line joining the top and front views of a point is perpendicular to xy. (True / False).
26. The top view of a point behind VP is always above xy. (True / False).
27. The front view of a point above HP is ----- xy.
28. A point is in the vertical plane. What is the position of its top view?
29. A point lies in the HP. Its front view lies in xy. (True / False).
30. The projections of a point lie in xy. Where is the point located?
31. Point P is in xy. State the position of top and front views of P.
32. When a point is situated in the third quadrant, it will be above Hp and in front of VP. (True / False).
33. A point is situated in the first quadrant. It is ----- Hp and ----- VP.
34. When a line is parallel to ----- plane, the top view will have its true length.
35. If a line is contained by HP and inclined to VP its front view will lie on -----.
36. Angle made by the front view of a straight line with xy is called -----
37. The point of intersection of a line or line produced with HP is called -----
38. When a line is ----- to HP, it will not have HT.
39. When a line is ----- to VP, it will not have VT.

40. If a line is parallel to VP, the true length of the line is seen in the top view. (True / False).
41. If the projections of the ends of a straight line are on the same projector, angles  $\Theta$  and  $\Phi$  are equal. (True / False).
42. Define a straight line.
43. State the various positions of straight line with respect to VP and HP
44. Name the two methods by which the true length of a straight can be determined.
45. Define the traces of a straight line.
46. Define Horizontal trace.
47. Define Vertical trace.
48. When will you get a point as an elevation in the projection of straight line?
49. What is the position of the straight line in projection to get  $\Theta + \Phi = 90^\circ$ ?
50. The projection of a straight line can be drawn if the projections of the two end points of the line are shown. (True / False).
51. A line parallel to one principal plane is always perpendicular to the other plane, (True / False).
52. If a line is parallel to a plane, its projection on that plane will have true length. (True / False).
53. A line perpendicular to one principal plane is parallel to the other. (True / False).
54. A line is inclined to the VP and parallel to HP, which of the views will have the true length?
55. If a line is in the HP, its ----- view coincides with xy.
56. If a line is in the VP, its ----- view coincides with xy.
57. A line is contained by both the HP and the VP; state the positions of its views.
58. A line is perpendicular to the HP. What is the shape of its top view?
59. If a line is perpendicular to the HP, its front view will have true length. (True / False).
60. Front view of the line perpendicular to the HP is ----- to xy.
61. When a straight line lies in a plane perpendicular to both HP and VP, the value of  $\Theta + \Phi =$  -----.
62. Maximum value of the sum of true angles of inclinations of a line is -----
63. Where will the straight line lie if its  $\Theta + \Phi = 90^\circ$ ?
64. The side view of a line parallel to both the HP and the VP is a -----
65. If a line is parallel to HP, its ----- view will have true length. If a line is parallel to VP, its ----- view will have true length.
66. The trace of a line is a -----
67. A line parallel to both the HP and the VP has no vertical and horizontal traces. (True / False).
68. A line inclined to VP and parallel to HP has ----- trace and no ----- trace.
69. A line inclined to HP and parallel to VP has ----- trace and no ----- trace.
70. A line is perpendicular to the HP. Its ----- trace coincides with its ----- view.
71. A line is perpendicular to the VP. Its ----- trace coincides with its ----- view.
72. A line perpendicular to HP has no ----- trace and a line perpendicular to VP has no ----- trace.
73. What is a solid?
74. State the major types / classification of solids.
75. What is a polyhedron?
76. What is a regular polyhedron?
77. Give examples of regular polyhedron.
78. A prism is a regular polyhedron. (True / false)
79. All polyhedra are bounded by only equal equilateral triangles. (True / false)
80. What is a tetrahedron?
81. What is an octahedron?

82. Define prism.
83. Define pyramid.
84. How are the prism named?
85. How are the pyramids named?
86. Give the nomenclature of a prism.
87. Give some types of prism.
88. Give the nomenclature of a pyramid.
89. Give some types of pyramid.
90. Define slant edge.
91. Give three examples of solids of revolution.
92. How is a cylinder obtained?
93. Give the nomenclature of a cylinder.
94. How is cone obtained?
95. Give the nomenclature of a cone.
96. How is a sphere obtained?
97. Define frustum.
98. What is a truncated solid?
99. When the axis of an object is perpendicular to the VP, it is ----- to the HP.
100. The shape of the top view of a cone with its base on the VP, is a -----
101. A solid has its axis perpendicular to the HP, which view will show the true shape of its base?
102. A solid is kept with its axis parallel to both the HP and VP. Which view will show the true shape of its ends?
103. What is the simple position of the solid?
104. How many corners and edges are present in an octahedron?
105. How many corners and edges are present in a hexahedron?
106. How many corners and edges are present in a tetrahedron?
107. In the orthographic views of a solid ----- are first located and they are connected by lines.
108. In a view of a solid the line connecting an invisible corner and a visible corner should be shown by ----
109. Write the types of auxiliary planes.
110. Define change of reference line method.
111. Define auxiliary vertical plane.
112. Define auxiliary inclined plane.
113. A plane has no thickness. (True / False)
114. In the orthographic projection, when a generator of a cylinder or cone coincides with the axis mark always the -----
115. When a prism rests with its base on HP, ----- view should be drawn first.
116. To represent a solid in the orthographic projection, at least two views are necessary. (True / false)
117. A tetrahedron has 4 equal edges and 4 equal equilateral triangular faces. (True / false)
118. A triangular pyramid becomes a tetrahedron when the slant edges are equal to the sides of the base. (True / false)
119. In first angle projection, the right side view should be drawn to the right side of the front view. (True / false)
120. Define the terms: Faces and Edges of a solid.
121. Define Apex.
122. Define Solid of revolution.
123. Always mark the invisible points within -----
124. Inclination of a line with the HP is always denoted as ----- and the inclination of a line with the VP is always denoted as -----

125. Angle made by the front view with XY is called the apparent angle -----.
126. Angle made by the top view with XY is called the apparent angle -----.
127. Apparent inclinations are always ----- than the true inclinations.
128. If the length of any view of a line is equal to the actual length of the line, then the view is said to have
129. ----- length.
130. An oblique solid has its axis ----- to the base.
131. How the front view and top view of a point are notated?

### UNIT I - Part B

1. Draw the projections of the following points on a common reference line:
  - P, 25mm below the HP and in the VP
  - Q, 40mm behind the VP and in the HP
  - R, 30mm below the HP and 30mm in front of the VP
  - S, 25mm above the HP and 25mm behind the VP
  - T, 25mm above the HP and 30mm in front of the VP.
  - U, in both the VP and HP
  - V, 35mm below the HP and 30mm behind the VP
  - W, 30mm above the HP and 35mm behind the VP
2. Draw the projections of the following points on a common reference line:
  - A, 25mm above the HP and 35mm in front of the VP
  - B, 25mm above the HP and 40mm behind the VP
  - C, 30mm below the HP and 40mm behind the VP
  - D, 30mm below the HP and 35mm in front of the VP
  - E, 25mm above the HP and in the VP.
  - F, 30mm below the HP and in the VP
  - G, 35mm in front of the VP and in the HP.
  - H, 40mm behind the VP and in the HP
3. A line AB 70mm long is inclined at an angle of  $40^\circ$  to HP and  $30^\circ$  to VP. The end A is in VP and 20mm above HP. Draw the projections of the line.
4. A line PQ, 60mm long has its end P in both HP and VP. It is inclined at an angle of  $30^\circ$  to HP and  $45^\circ$  to VP. Draw its projections
5. A line CD 75mm long is inclined at an angle of  $45^\circ$  to HP and  $30^\circ$  to VP. The point P is 15mm above HP and 20mm in front of VP. Draw the projections of the line.
6. A line measuring 80mm long has one of its ends 60mm above HP and 20mm in front of VP. The other end 15mm above HP and in front of VP. The front view of the line is 60mm long. Draw the Top view.
7. The mid point of a straight line AB is 60mm above HP and 50mm in front of VP. The line measures 80mm long and inclined  $30^\circ$  to HP and  $45^\circ$  to VP. Draw its projections.
8. A straight line PQ 10cm makes  $45^\circ$  to HP and  $30^\circ$  to VP. The end P is 3.6cm above HP and 4cm in front of VP. Draw the top and front views of the line. Measure the distance between the projectors of the ends of the line.
9. A line measuring 75mm long has one of its ends 50mm in front of VP and 15mm above HP. The other end is 15mm in front of VP and above HP. The top view of the line is 50mm long. Draw the projections.

10. A line AB 100mm long has its front view  $a'b'$  inclined at an angle of  $45^\circ$  to XY. The point A is in the VP and 25mm above HP. The length of the front view is 60mm. Draw the top view of the line and measure its length. Also find the inclinations of the line AB to HP and VP.
11. The distance between the projectors of two ends of a straight line is 40mm. One end is 15mm above HP and 10mm in front of VP. The other end is 40mm above HP and 40mm in front of VP. Find the true length and true inclinations of the line by (i) Rotating line method (ii) Trapezoid method. Compare the results.
12. A line AB 120mm long is inclined at an angle of  $45^\circ$  to HP and  $30^\circ$  to VP. Its mid point C is in VP and 20mm above Hp. The end A is in third quadrant and B is in first quadrant. Draw the projections of line.
13. A line MN 50mm long is parallel to VP and inclined at  $45^\circ$  to HP. The end M is 20mm above HP and 15mm in front of VP. Draw the projections of the line and find its traces.
14. Draw the projections of a straight line CD 30mm long parallel to HP and inclined to VP. The end C is 10mm in front of VP and D is 20mm in front of VP. The line is 15mm above HP. Also find its traces.
15. A line CD 80mm long has its end C 55mm in front of VP and 15mm above HP. The line is inclined at an angle of  $50^\circ$  to HP and  $40^\circ$  to VP. Draw the projections of the line and find its traces.
16. The projectors of the ends of a line EF are on the same projector. The end E is 15mm above the HP and 20mm in front of the VP. The end F is 45mm above the HP and 50mm in front of the VP. Draw the projections of the line and find its traces.
17. Draw the projections of a line PQ, 50mm long kept in the following positions:
  - a. Parallel to both the HP and VP: 15mm above the HP and 20mm in front of the VP.
  - b. Perpendicular to the VP and 20mm above HP. The end P, nearer to the VP is 15mm in front of it.
18. The end P of a line 60mm long is 15mm above the HP and 15mm in front of the VP. The line is parallel to the HP and inclined to the VP. The length of the elevation is 40mm. Draw the projections of the line and find the inclination of the line with the VP.
19. A line PQ 70mm long lies in the HP and has its end P in both the HP and VP. It is inclined at  $40^\circ$  to VP. Draw the projections of the line.
20. A line PQ is parallel to VP. The end P is 15mm above the HP and 20mm in front of the VP. The end Q is 60mm above the HP. The distance between the end projectors is 60mm. Find the true length and inclination of the line with the HP.
21. The end E of a line EF, 80mm long is in both the HP and the VP. The line is inclined at  $35^\circ$  to the HP and  $40^\circ$  to the VP. Draw its projections.
22. The projectors of two points M and N are 100mm apart. M is 55mm below the HP and 40mm in front of the VP. N is 100mm above the HP and 35mm behind the VP. Draw the projections of the line joining M and N. Determine the true length and inclinations of the line MN with the reference planes.
23. A line CD 70mm long has its end C 20mm above the HP and 15mm in front the VP. It is inclined at  $50^\circ$  to the HP and  $40^\circ$  to the VP. Draw its projections.
24. The end K of a line KL is in the VP and 30mm below the HP. The end L is in the HP and 45mm in front of the VP. The distance between the end projectors is 80mm. Draw the projections of KL and find its true length, traces and inclinations with the reference planes by rotating line method.
25. A pentagonal pyramid, side of base 30mm and axis 60mm long is lying with one of its triangular faces on the HP and axis parallel to VP. Draw its projections.
26. A hexagonal prism of side of base 30mm and axis 70mm is lying with one of its rectangular faces on the HP. The axis of the solid is parallel to HP and inclined at an angle of  $45^\circ$  to VP. Draw the front and top views of the solid.

27. A triangular prism, side of base 35mm and axis 60mm long lies with one of its longer edges on HP, such that the axis is parallel to both HP and VP. Draw its projections.
28. A cone 40 mm bases and axis 50mm long touch the VP on a point of its base circle. The axis is inclined at  $30^\circ$  to VP and the front view of the axis is inclined at  $45^\circ$  to HP. Draw its projections.
29. Draw the projections of a pentagonal prism of 30mm side of base and 65mm long lying on one of its longer edges on the HP with one of its rectangular face perpendicular to HP, such that the axis makes an angle of  $30^\circ$  to VP.
30. A hexagonal pyramid side of base 20mm, axis 50mm long lies with one of its triangular faces on HP. Its axis is parallel to VP. Draw its projections.
31. A pentagonal pyramid, side of base 20mm and axis 45mm long rests with one of its corners on HP, such that the base is inclined at an angle of  $60^\circ$  to HP and one side of base is perpendicular to VP. Draw its projections.
32. Draw the projections of a cube of 30mm edge, resting in the HP on one of its corners with a solid diagonal perpendicular to VP.
33. Draw the projections of a cylinder, base 30mm diameter and axis 40mm long, resting with a point of its base circle on HP, such that the axis is making an angle of  $60^\circ$  with HP and a vertical plane containing the axis is perpendicular to VP.
34. A hexagonal prism, side of base 30mm and axis 70mm long rests with one of the edges of its base on HP, such that its axis is inclined at  $30^\circ$  to HP and  $45^\circ$  to VP. Draw the projections.
35. A square pyramid, side of base 30mm and axis 50mm long rests with its base on HP, such that one of its edges of the base is parallel to and 10mm in front of VP. Draw its projections.
36. Draw the projections of an octagonal pyramid, side of base 20mm and altitude 55mm resting with its base on HP, such that one of the edges of the base is parallel to VP.
37. A tetrahedron of side 40mm rests with its base on HP. Draw its projections when one of its edges is perpendicular to VP.
38. A square prism, side of base 35mm and height 50mm rests with its base on HP, such that one of its rectangular faces is inclined at an angle of  $30^\circ$  to VP. Draw its projections.
39. Draw the projections of a cube of 40mm side resting with its edges on HP, such that one of its vertical faces is inclined at  $30^\circ$  to HP.
40. A pentagonal pyramid of base side 30mm, axis length 55mm has one of its slant faces in the VP and the axis parallel to and 30mm above the HP. Draw its projections.
41. A cone of base diameter 50mm and altitude 70mm rests on the HP on a point of its base with its axis parallel to both HP and VP. Draw its plan and elevation.
42. A square pyramid of base side 35mm and axis 70mm rests has a triangular face in the HP and the vertical plane containing the axis is inclined at  $40^\circ$  to the VP. Draw its projections.
43. A hexagonal pyramid of base side 35mm and height 70mm rests on one of its base edges on the HP with its axis inclined at  $30^\circ$  to the HP and parallel to the VP. Draw its projections.
44. Draw the projections of a cone of base diameter 40mm and altitude 60mm when it rests on the HP and on its base with its axis 40mm from the VP.
45. A cube of side 50mm rests on the HP on one of its edges a face containing which makes  $45^\circ$  with the HP. Draw its plan and elevation when the axis is perpendicular to the VP.
46. Draw the projections of a cylinder of diameter 50mm and axis length 80mm when it is lying on the ground with its axis inclined at  $45^\circ$  to the VP and parallel to the ground.
47. Draw the projections of a hexagonal prism of base side 20mm and axis length 50mm when it rests on the ground on one of the edges of the base and the axis inclined at  $35^\circ$  to the ground and parallel to the VP.
48. A cone of base diameter 60mm and altitude 75mm lies on the HP on one of its generators. The plan of the axis is inclined at  $45^\circ$  to the VP. Draw its projections.

## UNIT II – PART A

### SECTIONS OF SOLIDS:

1. Define Section or Cut surface.
2. Define Sectional View.
3. What is sectional Top view?
4. What is sectional Front view?
5. Discuss about sectional plane.
6. What are the types of section plane?
7. What is the true shape of section?
8. What are section lines?
9. Define hatching.
10. When will you get the true shape of the section in the front view?
11. Generally the major portion of the solid should be retained for \_\_\_\_\_ and shown by \_\_\_\_\_ lines in both the views.
12. If the section plane is \_\_\_\_\_ to HP the cut surface obtained in the top view itself is the true shape of section.
13. What is apparent shape of section?
14. The projection of a section plane on the reference plane to which it is perpendicular is a \_\_\_\_\_.
15. Define Auxiliary Vertical Plane (AVP).
16. Define Auxiliary Inclined Plane (AIP).
17. Define Cutting Plane.
18. Why do you section a solid?
19. Explain the method of obtaining the true shape of section of a solid.
20. Distinguish between true shape of section and apparent shape of section.
21. What is the true shape of section when the cone is cut by a plane parallel to its generator?
22. What will be the position of the cube and cutting plane to get the true shape of section as rhombus?
23. What is the symbol for cutting plane?
24. What is meant by sectioning an object?
25. State any two purpose / uses of sectioning.
26. Define Cutting plane / Section plane.
27. What are section points?
28. While drawing the sectional view, the portion of the object between the section plane and \_\_\_\_\_ is assumed to be removed.
29. A cutting plane perpendicular to the HP is shown in the \_\_\_\_\_ view.
30. A cutting plane perpendicular to the VP is shown in the \_\_\_\_\_ view.

31. When the cutting plane is perpendicular to both the HP and VP, the sectional \_\_\_\_\_ view will give the true shape of the section.
32. The no. of sides of the section will be equal to the no. of edges cut. (True / False)
33. Whatever be the position of the plane cutting a sphere, the true shape of the section is a circle. (True / False)
34. A cone is cut with a section plane parallel to the axis passing through the apex. The true shape of the section obtained is a \_\_\_\_\_.
35. What is the true shape obtained when cutting plane cuts the following solids parallel to their base?
  - a. An upright Cylinder
  - b. An upright cone
  - c. An upright square pyramid
  - d. An upright hexagonal pyramid.
36. Name the methods of drawing the sectional views of cone.
37. An upright cylinder is cut by a plane parallel to its axis. What is the shape of the section obtained?
38. An upright cone is cut by a plane which is inclined to the axis and is not parallel to a generator. The plane cuts all the generators. What is the shape of the Section?
39. An upright cone is cut by a plane which is inclined to the axis and is parallel to a generator. What is the shape of the section?
40. An upright cone is cut by a plane which is parallel to the axis but does not pass through the apex. What is the shape of section obtained?
41. A sphere is cut by a vertical plane inclined to VP. What is the true shape of the section?
42. A cylinder rest on its base on HP. It is cut by a plane inclined to the VP and perpendicular to HP. What will be the true shape of the section?
43. What is the need for determining the true shape of section?



### **CONVERSION OF PICTORIAL VIEW TO ORTHOGRAPHIC VIEW:**

1. Write the principles of orthographic views?
2. Write the procedure rules for lines?
3. What is one view drawing?
4. What are two view drawings?
5. What are three view drawings?
6. What are the rules for selection of views?
7. Give example for one view drawing.
8. Give examples for three view drawings.
9. Give examples for three view drawings.

### **UNIT II – PART B**

#### **SECTION OF SOLIDS:**

1. A hexagonal prism, side of base 25mm and axis 60mm long rests with one of the edges of its base on HP; its axis is inclined at  $45^\circ$  to HP and parallel to VP. A section plane perpendicular to HP and inclined at  $45^\circ$  to VP passes through a point on the axis at a distance of 15mm from one of its ends. Draw the sectional front view and the true shape of section.
2. A pentagonal pyramid, side of base 30mm and axis 65mm long lies with one of its triangular faces on HP and its axis is parallel to VP. A section plane perpendicular to HP and inclined at  $30^\circ$  to VP bisects the axis. Draw the sectional front view and the true shape of section assuming the portion containing the apex is removed.
3. A cone, base 50mm diameter and height 75mm stands on HP with its circular base. A section plane inclined at  $45^\circ$  to HP and perpendicular to VP bisects the axis of the cone. Obtain the front and sectional top views.
4. A cube of side base 25mm rests on the HP on one of its faces with a vertical face inclined at  $35^\circ$  to the VP. A plane perpendicular to the HP and inclined at  $50^\circ$  to the VP cuts the cube. Draw the top view and sectional front view. Also draw the true shape of the section.
5. A cube of side 30mm rests on the HP on its end with the vertical faces equally inclined to the VP. It is cut by a plane perpendicular to the VP and inclined at  $30^\circ$  to the HP meeting the axis at 25mm above the HP. Draw its top view, sectional front view and true shape of the section.
6. A cube of side 40mm is placed and cut by a plane in such a way that the true shape of the section is a regular hexagon. Draw the front and top views of the cube and determine the inclination of the cutting plane with the HP.

7. A square prism of base side 30mm and height 60mm rests on HP on one of its ends with two of its rectangular faces equally inclined to the VP. It is cut by a plane perpendicular to the VP and inclined at  $60^\circ$  to the HP meeting the axis at 15mm from the top. Draw its elevation, sectional plan and the true shape of the section.
8. A hexagonal prism, side of base 30mm and axis 70mm long rests on the HP on one of its rectangular faces with its axis perpendicular to the VP. It is cut by a vertical plane inclined at  $30^\circ$  to the VP. Draw the top view, sectional elevation and the true shape of the section.
9. A pentagonal prism of base side 30mm and length 70mm is lying on the HP on one of its rectangular faces with its axis perpendicular to VP. It is cut by a plane perpendicular to the VP and inclined at  $45^\circ$  to the HP. The shortest distance between the axis and the cutting plane is 10mm. Draw the front view, sectional top views and the true shape of the section.
10. A pentagonal prism of base side 40mm and length 80mm is lying on the HP on one of its rectangular faces with its axis parallel to both the HP and the VP. It is cut by a plane perpendicular to the HP and inclined at  $30^\circ$  to the xy. The cutting plane meets the axis at 16mm from one of its ends. Draw the top view, sectional front view and the true shape of the section.
11. A pentagonal prism of base side 40mm and length 80mm is resting on one of its base edges on the HP with its axis inclined at  $45^\circ$  to the HP and parallel to the VP. It is cut by a plane perpendicular to the VP and inclined at  $30^\circ$  to the HP. The cutting plane meets the axis at 30mm from the top end. Draw the front view, sectional top views and the true shape of the section.
12. A hexagonal prism, side of base 40mm and axis 80mm rests on one of its base edges on the HP. The end containing that edge is inclined at  $30^\circ$  to the HP and the axis is parallel to VP. It is cut by a plane perpendicular to the VP and parallel to the HP. The cutting plane bisects the axis. Draw the front and sectional top views.
13. A hexagonal prism, side of base 40mm and axis 80mm rests on one of its base edges on the HP. The end containing that edge is inclined at  $30^\circ$  to the HP and the axis is parallel to VP. It is cut by a vertical plane parallel to the VP at a distance of 35mm from the plan of the axis. Draw the top view, sectional front view.
14. A hexagonal prism, side of base 30mm and axis length 70mm is resting on one of its corners on HP, the two edges of the base containing the corner being equally inclined to the HP. The axis is inclined at  $30^\circ$  to the HP and is parallel to the VP. The prism is cut by a plane perpendicular to the VP and inclined at  $45^\circ$  to the HP. The cutting plane meets the axis at

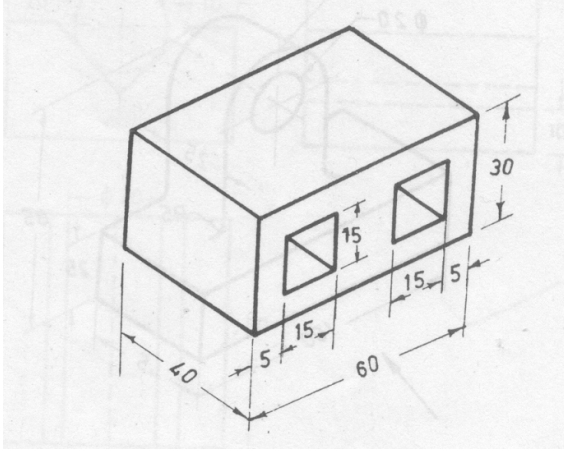
- a distance of 34mm from the top end. Draw the front view, sectional top views and the true shape of the section.
15. A pentagonal pyramid of base side 20mm and altitude 55mm rest on its base on HP with one of the base edge perpendicular to the VP. It is cut by a plane inclined at  $30^\circ$  to the base. The cutting plane meets the axis at 15mm above the base. Draw the front view, sectional top views and the true shape of the section.
  16. A square pyramid of base side 25mm and altitude 40mm rests on the HP on its base with the base edges equally inclined to the VP. It is cut by a plane perpendicular to the VP and inclined at  $30^\circ$  to the HP meeting the axis at 21mm above the HP. Draw the sectional plan and the true shape of the section.
  17. A hexagonal pyramid of base side 25mm and axis 55mm rests on its base on the HP with two base edges perpendicular to the VP. It is cut by a plane perpendicular to the VP and inclined at  $30^\circ$  to the HP meeting the axis at 20mm from the vertex. Draw the elevation, sectional plan and true shape of the section.
  18. A pentagonal pyramid of base side 20mm and altitude 45mm rest on its base on HP with an edge of the base perpendicular to the VP. It is cut by a plane perpendicular to both the HP and VP. The cutting plane cuts the object at 8mm from the axis in the plan. Draw the front, top and right end view of the pyramid.
  19. A hexagonal pyramid of base side 20mm and axis 55mm rests on its base on the HP with two base edges parallel to the VP. It is cut by a vertical plane inclined at  $30^\circ$  to the VP and cutting the pyramid at 5mm from the plan of the axis. Draw the top view, sectional front view and an auxiliary elevation on an AVP parallel to the cutting plane.
  20. A pentagonal pyramid of base side 40mm and altitude 80mm rests on one corner of the base on the HP such that the axis inclined at  $30^\circ$  to the HP and parallel to the VP. The base edges containing the resting corner are equally inclined to the HP. A cutting plane parallel to the HP cuts the solid bisecting the axis. Draw the front view and the sectional top view of the pyramid.
  21. A square pyramid of base side 30mm and altitude 50mm lies on one of its triangular faces on the HP with its axis parallel to the VP. It is cut by a vertical plane inclined at  $30^\circ$  to the VP meeting the axis at 40mm from the vertex measured in the plan. Draw the plan, sectional elevation and the true shape of the section.
  22. A cylinder of diameter 40mm and height 50mm rests on its base on the HP. It is cut by a plane perpendicular to the VP and inclined at  $50^\circ$  to the HP. The cutting plane meets the axis at a distance of 15mm from the top.

Draw the front view, sectional top view and the true shape of the section.

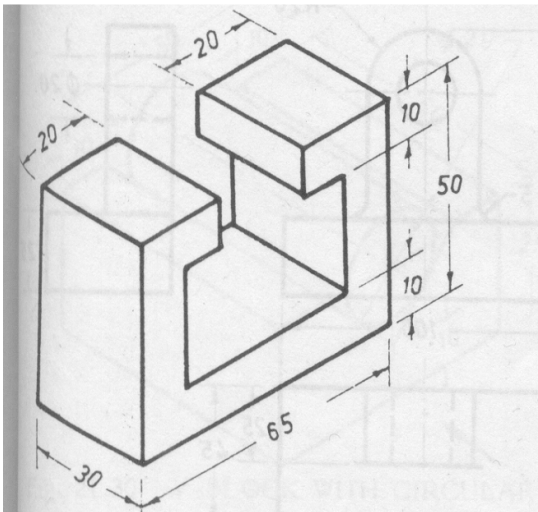
23. A cylinder of diameter 40mm and axis length 60mm lies on the HP on one of its generators with its axis parallel to the HP and inclined at  $30^\circ$  to the VP. It is cut by a plane perpendicular to the HP so that the true shape of the section is an ellipse of major axis 55mm. Draw the sectional front view and true shape of the section.
24. A cylinder of diameter 60mm and height 80mm is lying on the HP with its axis parallel to both the HP and the VP. A vertical plane inclined at  $25^\circ$  to the VP cuts the cylinder and passes through the mid-point of the axis. Draw the sectional front view and the true shape of the section.
25. A right circular cone of base diameter 40mm and axis length 60mm rests on its base on the HP. It is cut by a plane perpendicular to the HP and inclined at  $45^\circ$  to the VP. The shortest distance between the cutting plane and the plan of the axis is 10mm. Draw the plan, sectional elevation and the true shape of the section.
26. A cone of base diameter 50mm and axis length 60mm lies on the HP on one of its generators. The cone is cut by a vertical plane inclined at  $75^\circ$  to the VP and meeting the axis at 27mm from the vertex in the plan. Draw the top view, sectional front view and the true shape of the section.
27. A cone of base diameter 50mm and altitude 60mm rests on its base on the HP. It is cut by a plane perpendicular to the VP and parallel to one of the extreme generators, 10mm away from it. Draw the sectional plan and the true shape of the section.
28. A cone of base diameter 40mm and altitude 50mm rests on its base on the HP. It is cut by a section plane perpendicular to the VP and inclined at  $80^\circ$  to the HP, passing through the apex. Draw the sectional plan and the true shape of the section.
29. A sphere of diameter 80mm is cut by a vertical plane inclined at  $40^\circ$  to the VP. The cutting plane is located at a minimum distance of 20mm from the centre of the sphere. Draw the top view, sectional front view and the true shape of the section.

**CONVERSION OF PICTORIAL VIEW TO ORTHOGRAPHIC VIEW:**

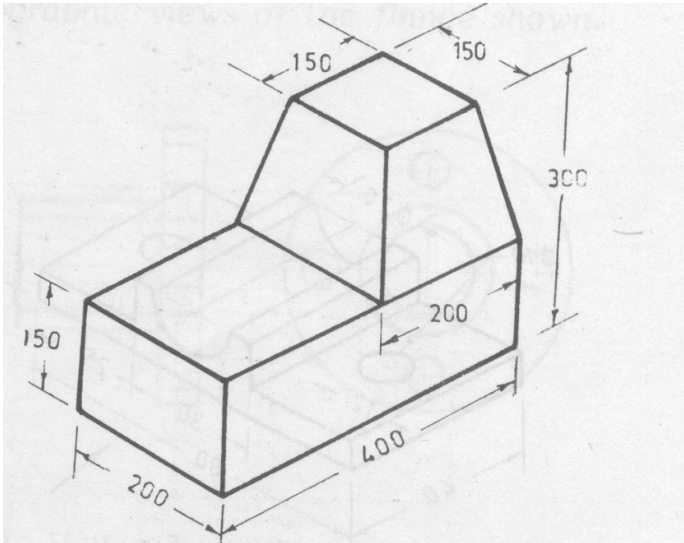
30. Draw the required orthographic view:



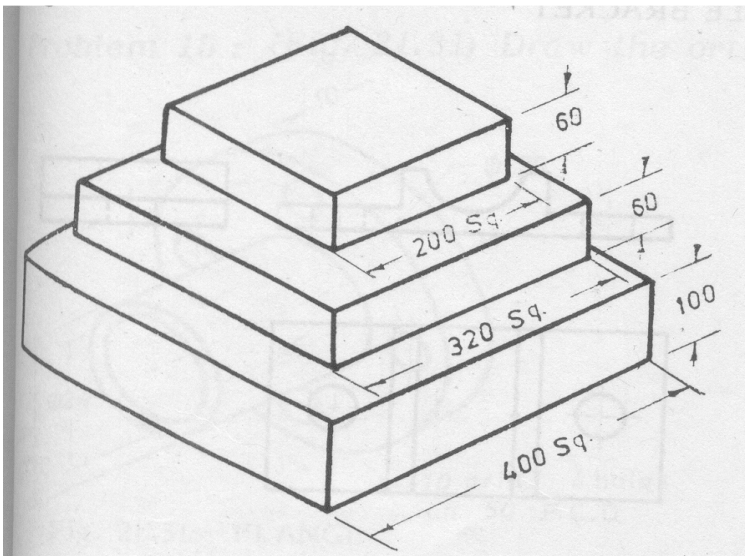
31. Draw the required orthographic view:



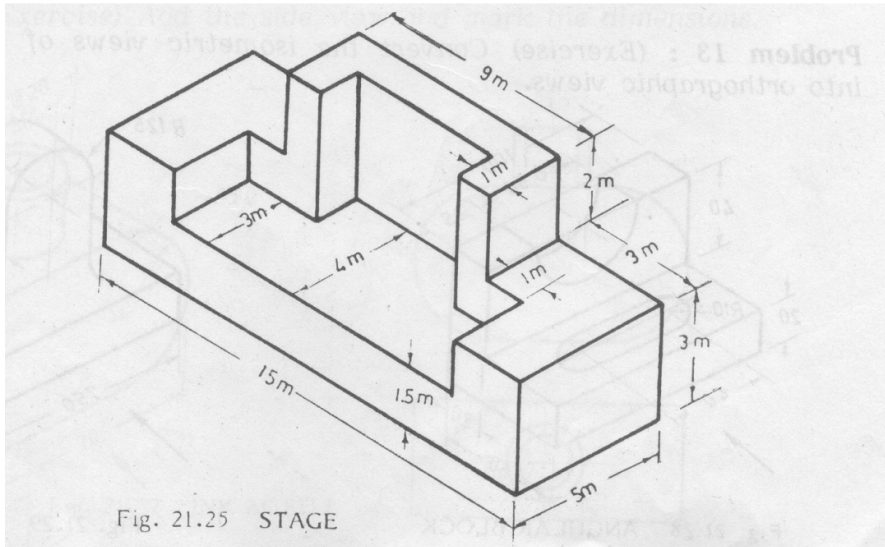
32. Draw the required orthographic view:



33. Draw the required orthographic view:



34. Draw the three orthographic views:



35. Draw the three orthographic views:

