Rotation and Inclination of Oblique Solids

Fig. 5.20 shows a rectangular-based oblique pyramid. Draw three views of this object when surface A is on the horizontal plane.
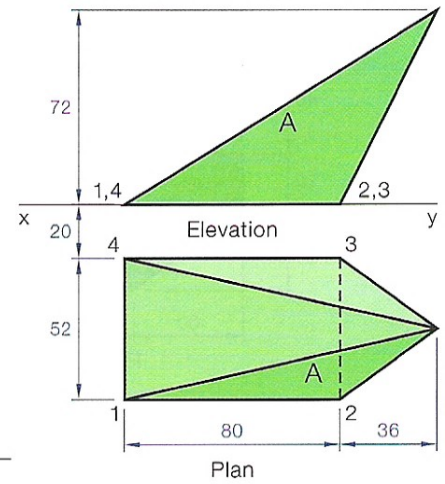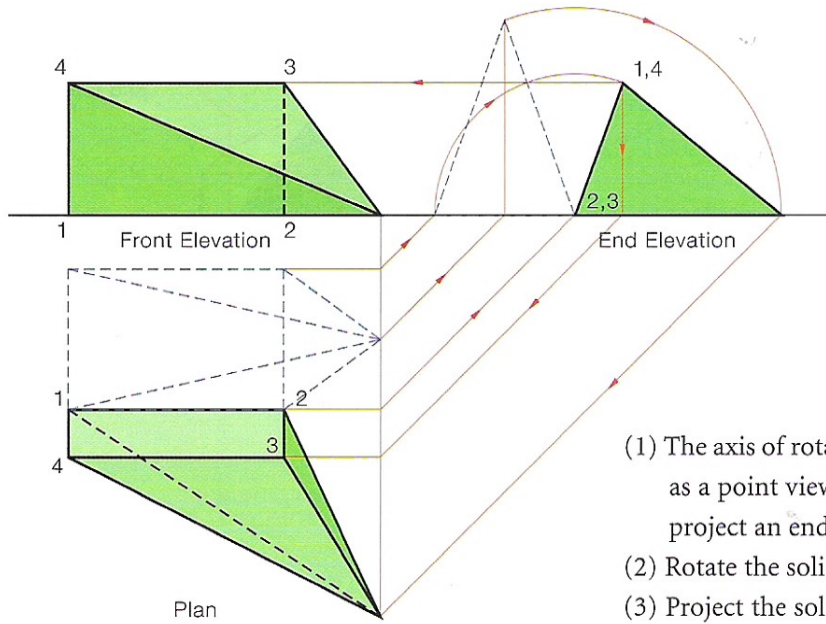

Fig. 5.20

Front Elevation

End Elevation

Plan

Fig. 5.21

(1) The axis of rotation will be edge 1,2. This edge can be seen as a point view in the end view. Draw the given plan and project an end view.
(2) Rotate the solid in end view, about edge 1,2.
(3) Project the solid back through the views thus finding the plan and front elevation, Fig. 5.21.

Fig. 5. 22 shows an oblique rectangular prism having one face on the VP. Draw views of the object when the prism is rotated about edge ad until edge bc touches the horizontal plane.
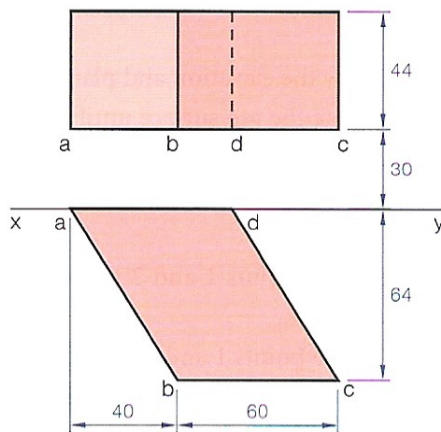

Fig. 5.22

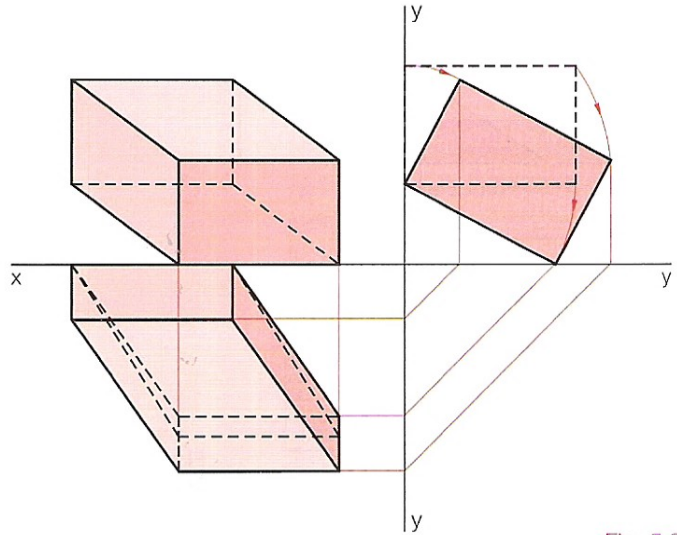The construction of the solution should be clear from the diagram Fig. 5.23.

Fig. 5.23

An oblique regular hexagonal-based pyramid is shown in Fig. 5.24. Draw a new front elevation, end elevation and plan of the object when the base is rotated about edge ab until it makes an angle of 30° to the horizontal plane.
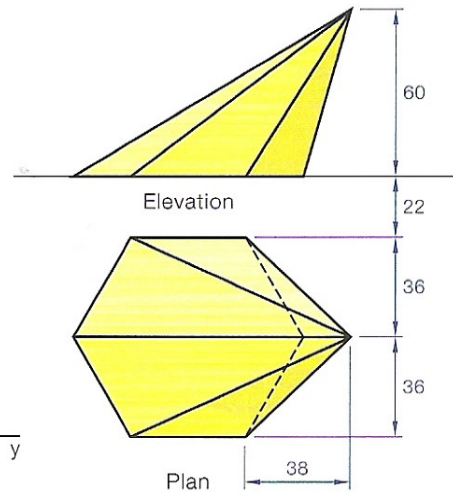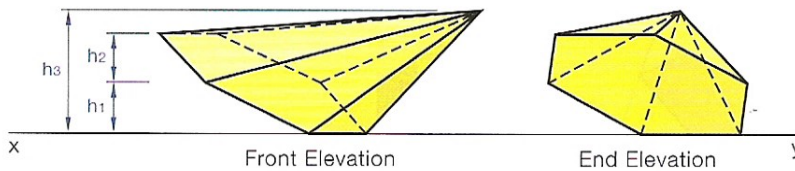

Elevation

60

22
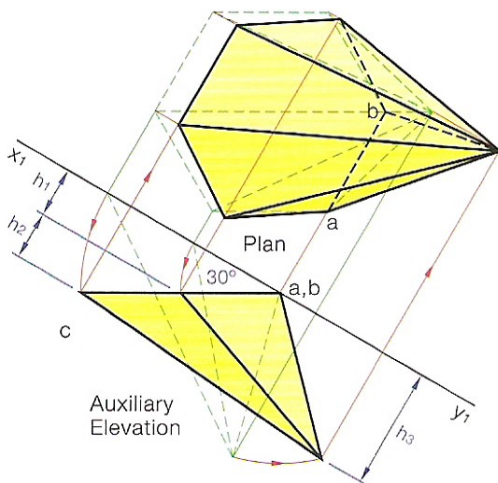
36

36

Plan   38

Front Elevation   End Elevation

Fig. 5.24

(1) Draw the plan as given.

(2) Since the solid is being rotated about ab we take an auxiliary elevation viewing along edge ab.

(3) We can rotate the solid in the auxiliary.

(4) Points are projected back to the plan from the auxiliary. Points on the original plan move perpendicular to the axis line ab.

(5) Once the plan is completed the elevations are found. Heights are taken from the auxiliary elevation as shown, Fig. 5.25.

Fig. 5.25

Auxiliary Elevation

Plan

30°

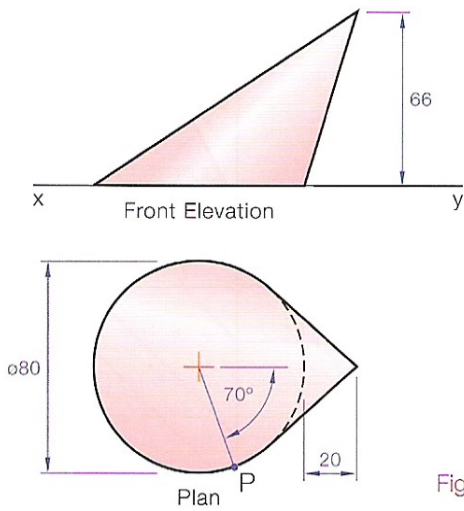66

x   Front Elevation   y

o80

70°

20

P

Plan

Fig. 5.26

Fig. 5.26 shows an oblique cone. Draw the projections of the solid when the base is tilted to an angle of 45° to the horizontal plane and point P rests on the horizontal plane.

(1) Draw the given plan.
(2) Join P to the centre of the base circle. Draw the x_1y_1 line parallel to this line.
(3) The solid is rotated in the auxiliary.
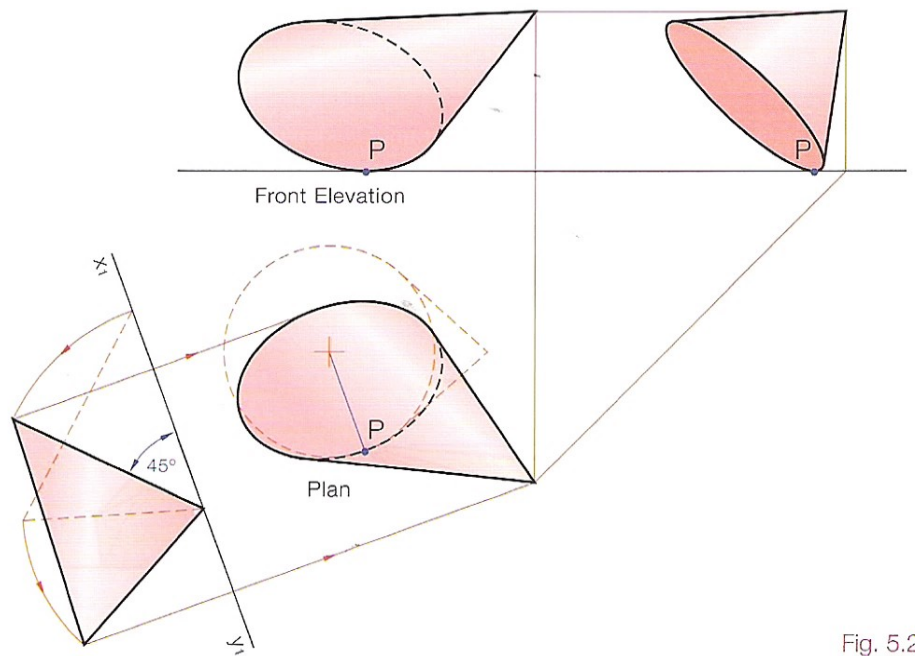(4) Project the views in the usual way, Fig. 5.27.

P   P

Front Elevation

x_1

45°

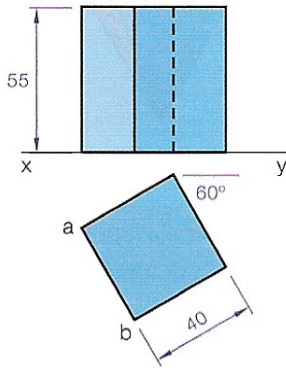P

Plan

y_1

Fig. 5.27

Activities

Fig. 5.28

Q1. The plan and elevation of a square-based prism is shown in Fig. 5.28. Draw a front elevation, end elevation and plan of the prism when the bottom face is inclined at 20° to the horizontal plane and edge ab rests on the horizontal plan.
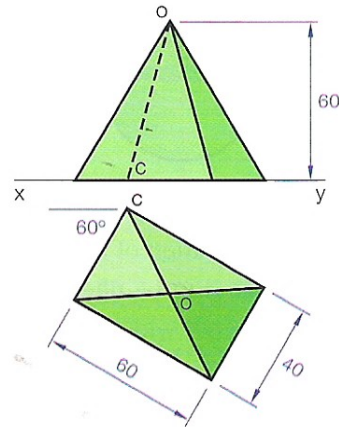
Q2. The plan and elevation of a rectangular-based pyramid are shown in Fig. 5.29. Draw the front elevation, end elevation and plan of the pyramid when the edge co is vertical and corner c rests on the horizontal plane.
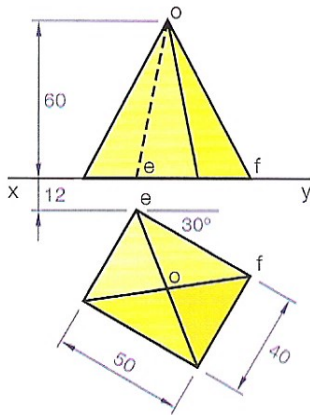
Fig. 5.29

Fig. 5.30

Q3. The pyramid in Fig. 5.30 is to be rotated about edge ef until the apex o touches the vertical plane. Draw the front elevation, end elevation and plan of the pyramid in its new position.

Q4. Fig. 5.31 shows the plan and elevation of a hexagonal-based prism. The prism is to be rotated about edge 1,2 until edge 3,4 is directly above edge 1,2. Draw the plan, front elevation and end view of the prism in its new position.
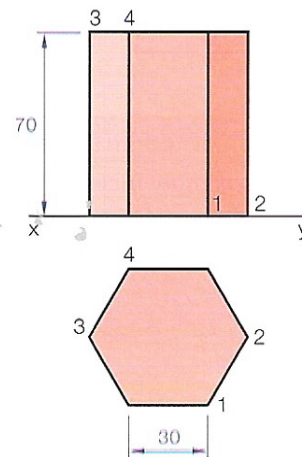
Fig. 5.31

Q5. A pentagonal-based pyramid rests on the vertical plane. The pyramid is rotated about edge 1,2 until surface 1,2,3 rests on the vertical plane. Draw the front elevation, end elevation and plan of the solid in its new position, Fig. 5.32.
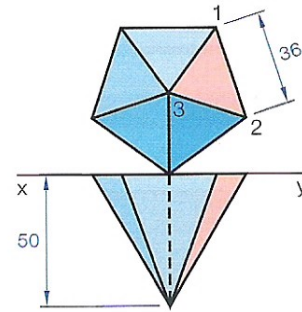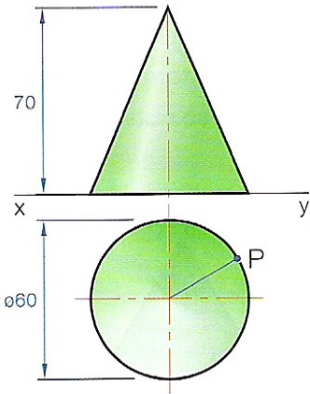

Fig. 5.32

Fig. 5.33

Q6. Fig. 5.33 shows the plan and elevation of a cone. The cone is to be tilted on point P so that the base makes an angle of 20° with the horizontal plane. Draw the front elevation, end elevation and plan of the solid when it is tilted.

Q7. The plan and elevation of a cylinder are shown in Fig. 5.34. The cylinder is to be tilted on point P until the base makes an angle of 60° with the horizontal plane. Draw the front elevation, end elevation and plan of the tilted solid.
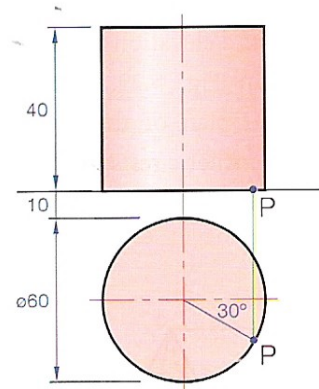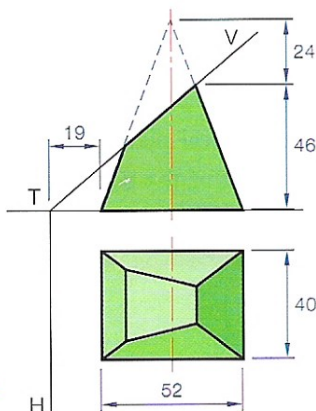

Fig. 5.34

Fig. 5.35

Q8. A rectangular-based pyramid has been cut by the simply inclined plane VTH. Draw the front elevation, end elevation and plan of the solid when the pyramid has been rotated so that the cut surface is parallel to the horizontal plane.

Q9. A tetrahedron of 70 mm side is shown in Fig. 5.36. It is to be cut by the simply inclined plane VTH. Draw the front elevation, end elevation and plan of the cut tetrahedron after it has been rotated about edge 1,2 until the cut surface is horizontal.
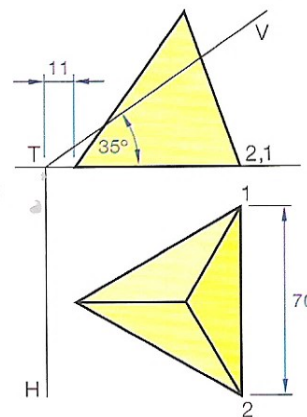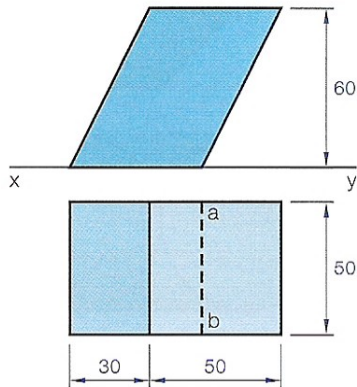

Fig. 5.36

H I G H E R   L E V E L

Fig. 5.37

Q10. A square-based oblique prism is shown in Fig. 5.37. Draw the front elevation, end elevation and plan of the solid when the base makes an angle of 20° to the horizontal plane, and edge ab remains on the horizontal plane.

Q11. An oblique pyramid is shown in Fig. 5.38. Draw the front elevation, end elevation and plan of the solid when surface A is inclined at 30° to the horizontal and edge pq remains on the horizontal plane.
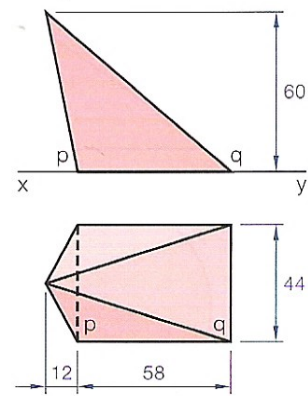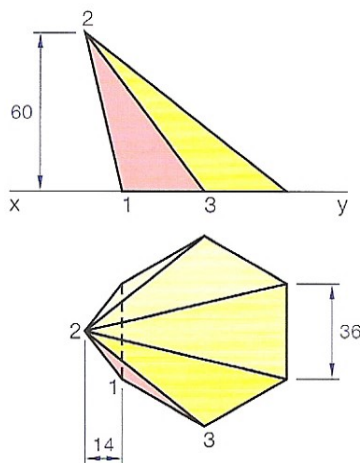

Fig. 5.38

Q12. Draw the front elevation, end elevation and plan of the oblique, hexagonal-based pyramid, when surface 1,2,3 is on the horizontal plane, Fig. 5.39.

Fig. 5.39

Q13. An oblique cylinder is shown in Fig. 5.40. The cylinder is to be rotated keeping P on the horizontal plane until the base makes an angle of 40° with the horizontal plane. Draw the front elevation, end elevation and plan of the object after it is rotated.
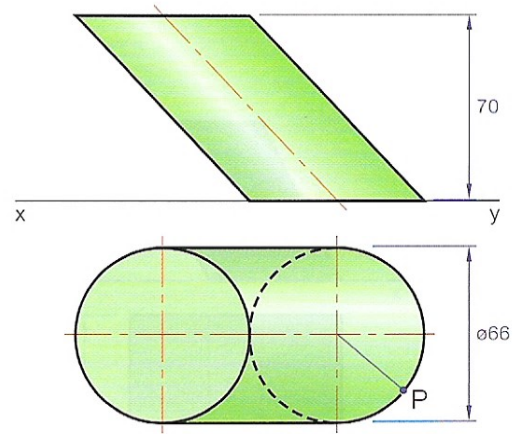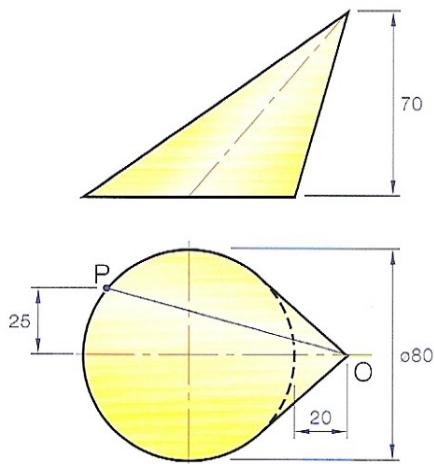
70

x   y

ø66

P

Fig. 5.40

70

Q14. Draw the front elevation, end elevation and plan of the oblique cone when point P is on the horizontal plane and generator OP is vertical, Fig. 41.

P

25

ø80

O

20

Fig. 5.41