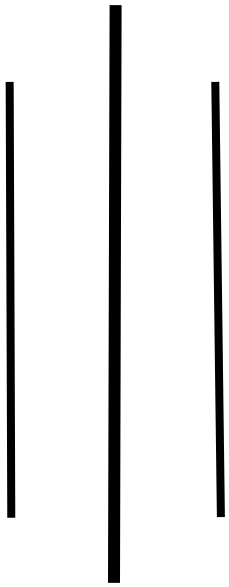
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING

PULCHOWK CAMPUS

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING



ENGINEERING DRAWING

[TUTORIAL SHEETS]

2080

TABLE OF CONTENTS

ENGINEERING DRAWING
SHEET NO: 1
(TECHNICAL LETTERING)

1. Draw the following patterns shown in **Figure 1** using T-square and set-square or mini-drafter.

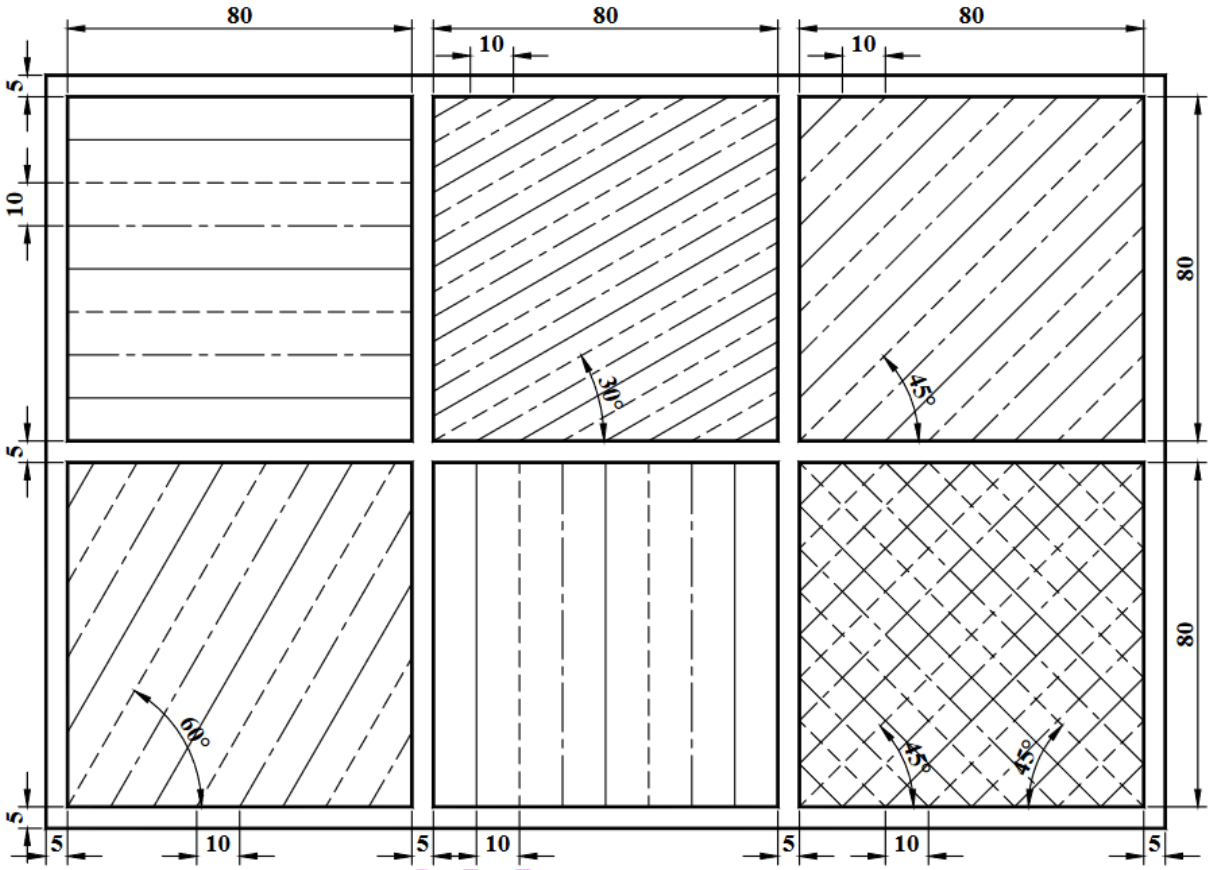


Figure 1.1

2. Dimension the following figures. Size may be obtained by measuring the drawing or assume any suitable dimension.

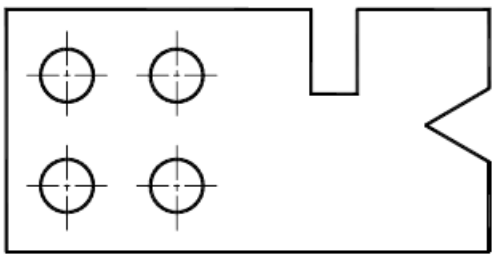


Figure 1.2 a

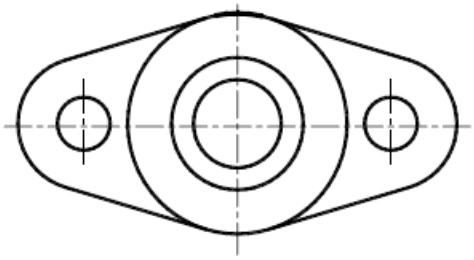


Figure 1.2 b

ENGINEERING DRAWING
SHEET NO: 1
(TECHNICAL LETTERING)

3. Prepare freehand sketches of the views given in following figures.

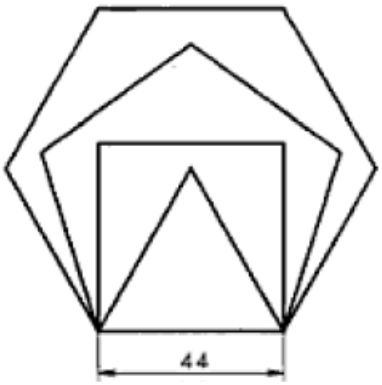


Figure 1.3 a

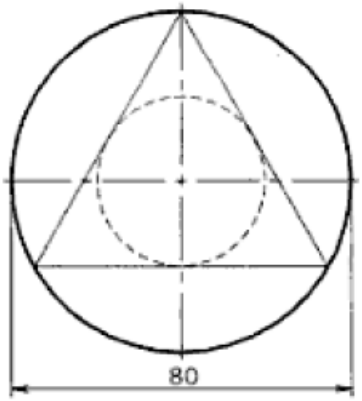


Figure 1.3 b

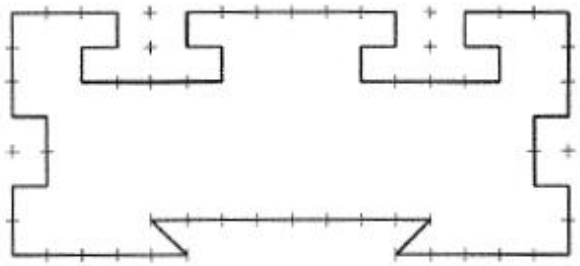


Figure 1.3 c

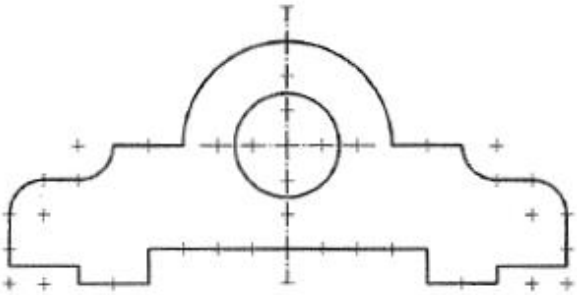
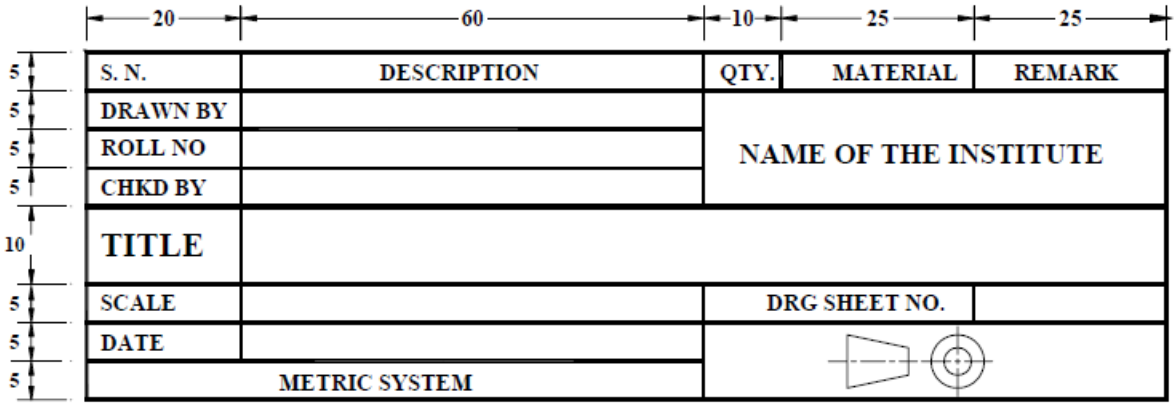


Figure 1.3 d

4. Draw the title block as per the given dimensions and complete it.



ENGINEERING DRAWING
SHEET NO: 2
(PLANE GEOMETRICAL CONSTRUCTION)

1. Draw a line 67 mm long and divide it in the proportion of 1:2:3.
2. **(a)** Draw a regular pentagon inscribed on a circle of 60 mm diameter.
   (b) Draw a regular hexagon with a distance of 60 mm across its corners.
   (c) Draw a regular octagon with a distance of 66 mm across its flats.
3. Draw an arc of radius 20 mm tangent to two given lines inclined at
   (a) 60^0 **(b)** 90^0 **(c)** 120^0
4. **Figure 2.4** shows a straight line and a circle. Draw an arc of radius 30 mm tangent to both the given line and circle and outside to the given circle and including the given circle.

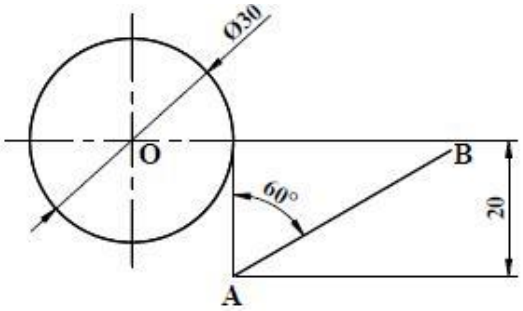


Figure 2.4

5. Draw two circles with radii 15 mm and 20 mm respectively with their centers lying on a horizontal line and 60 mm apart. Draw an arc tangent of radius 50 mm including the circle with radius 15 mm. and outside of the circle with radius 20mm.
6. Draw two circles with radii 20 mm and 30 mm respectively with their centers lying on a horizontal line and 60 mm apart. Draw internal and external line tangents to the circles.
7. Draw a parabola with axis length of 60 mm and double ordinate of 80 mm.
8. Draw an ellipse with major and minor axes of 80 mm and 60 mm respectively.
9. Draw a hyperbola with the distance across foci of 60 mm and transverse axis distance of 40 mm.
10. Draw the involutes of the plane figures shown in **Figure 2.10 below**.

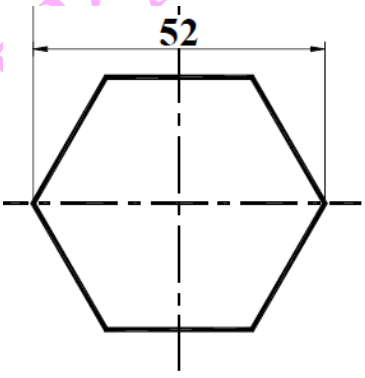


Figure 2.10 a

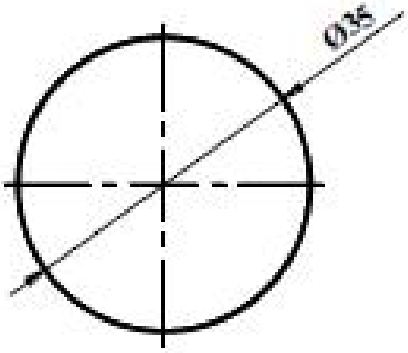


Figure 2.10 b

ENGINEERING DRAWING
SHEET NO: 2
(PLANE GEOMETRICAL CONSTRUCTION)

11. A circle of 50 mm diameter rolls on a horizontal surface. Draw the locus of a fixed point on the circumference of the circle for one complete revolution. Name the curve.

12. Draw an Archemedian Spiral for one and half convolutions with pitch equal to 40 mm.

13. Draw helix for having a pitch of 50 mm on a cylinder with the diameter of 40 mm and height of 75 mm and also find helix angle.

ENGINEERING DRAWING
SHEET NO: 3
(DESCRIPTIVE GEOMETRY)

1. Draw the projections of the following points.

(a) Point **A** 20 mm above the HP and 15 mm in front of the VP.

(b) Point **B** 25 mm above the HP and 10 mm behind the VP.

(c) Point **C** 15 mm below the HP and 25 mm behind the VP.

(d) Point **D** 10 mm below the HP and 15 mm in front of the VP.

(e) Point **E** in the HP and 15 mm in front of the VP.

(f) Point **F** 20 mm above the HP and in the VP.

2. Draw the projections of the following straight lines.

(a) Straight line **AB** 20 mm long parallel to both the VP and HP. and lying 10 mm above the HP and 15 mm in front of the VP.

(b) Straight line **CD** 25 mm long perpendicular to the HP and 20 mm in front of the VP with its lower end 10 mm above the HP.

(c) Straight line **EF** 30 mm long perpendicular to the VP and 15 mm above the HP and its end nearer to the VP is 10 mm in front of it.

(d) Straight line **GH** 25 mm long parallel to the VP and inclined to the HP at 30^0. One of its ends is 12 mm above the HP and 18 mm in front of the VP.

(e) Straight line **IJ** 20 mm long parallel to the HP and 15 mm above the HP and inclined at 40^0 to the VP. Its end nearer to the VP is 10 mm in front of it.

(f) Straight line **PQ** 25 mm long contained on the HP and perpendicular to the VP with its end nearer to the VP is 15 mm in front of it.

3. Top view of a straight line 50 mm long measures 40 mm. The line is on the VP with its lower end 12 mm above the HP. Draw its projections and determine its inclination with the HP.

4. A square **ABCD** of 20 mm side is parallel to the VP and 15 mm in front of it. Draw its projections when its edge nearer to the HP is parallel to it and 10 mm above it.

5. A square **ABCD** of 25 mm side is parallel to the HP and 18 mm above it. Draw its projections when its edge nearer to the VP is parallel to the VP and 12 mm in front of it.

6. A regular hexagon **ABCDEF** of side 20 mm is parallel to the HP and 15 mm above it. Draw its projections when its corner **A** nearer to the VP is 16 mm in front of the VP and edge **AB** is inclined at 39^0 to the VP.

7. A rectangle **ABCD** of 60 mm □ 40 mm is perpendicular to the HP and inclined to the VP at 41^0. It is resting on its longer edge on the HP. Draw its projections when its edge nearer to the VP is parallel to the VP and 16 mm in front of it.

ENGINEERING DRAWING
SHEET NO: 3
(DESCRIPTIVE GEOMETRY)

8. A regular hexagon **ABCDEF** of 25 mm side rests on one of its edges on the HP. Its plane is perpendicular to the VP and inclined to the HP at 30^0. Draw its projections when its corner nearer to the VP is 15 mm in front of it.

9. A circle of 40 mm diameter is held in such a way that it is perpendicular to the HP and inclined to the VP at 44^0. Draw its projections when a point on its circumference is nearer to the VP is 25 mm above the HP and 10 mm in front of the VP.

10. Top view and front view of a line **MN** 60 mm long measures 50 mm and 40 mm respectively. One of its ends is 15 mm above the HP and 10 mm in front of the VP. Draw its projections and determine its true inclination with the VP and HP.

11. Orthographic projection of a line is given in **Figure 3.11**. Determine its true length and inclinations with the HP and VP using,

(a) Revolution method and

(b) Auxiliary view method.

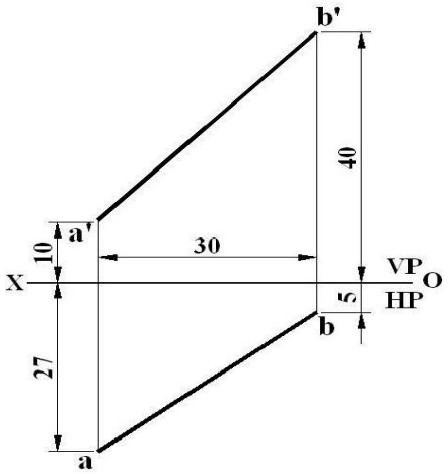


Figure 3.11

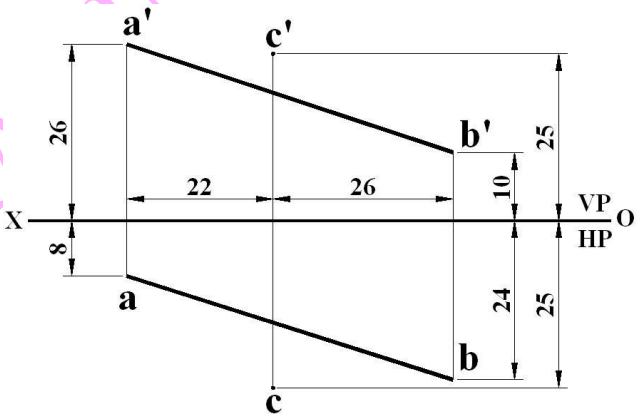


Figure 3.12

12. Determine the shortest distance between the point **C** and the line **AB**, shown in **Figure 3.12.**

13. Complete the orthographic projections a point **P** lying on a triangular plane **ABC** shown in **Figure 3.13.**

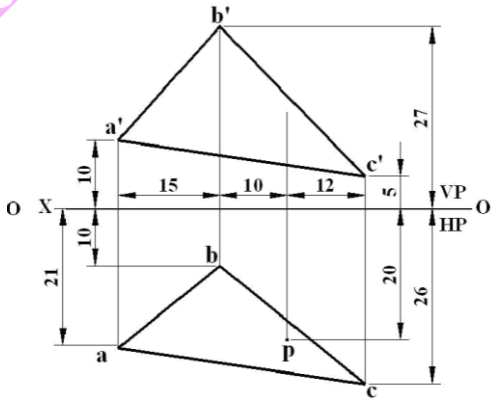


Figure 3.13

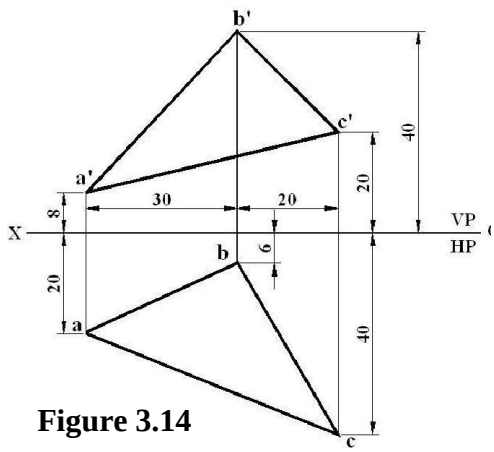


Figure 3.14

ENGINEERING DRAWING
SHEET NO: 3
(DESCRIPTIVE GEOMETRY)

14. Determine the true shape of the triangular plane **ABC** shown in **Figure 3.14** and its inclination with the HP. Also draw its true shape.

15. Orthographic projections of a plane **EFG** and a line **JK** are given in **Figure 3.15**. Draw the front and top views of the piercing point and show the visibility of the line. Also determine the true angle between the line and the plane.

16. Determine the true angle between the given planes **ABC** and **BCD** shown in **Figure 3.16.**

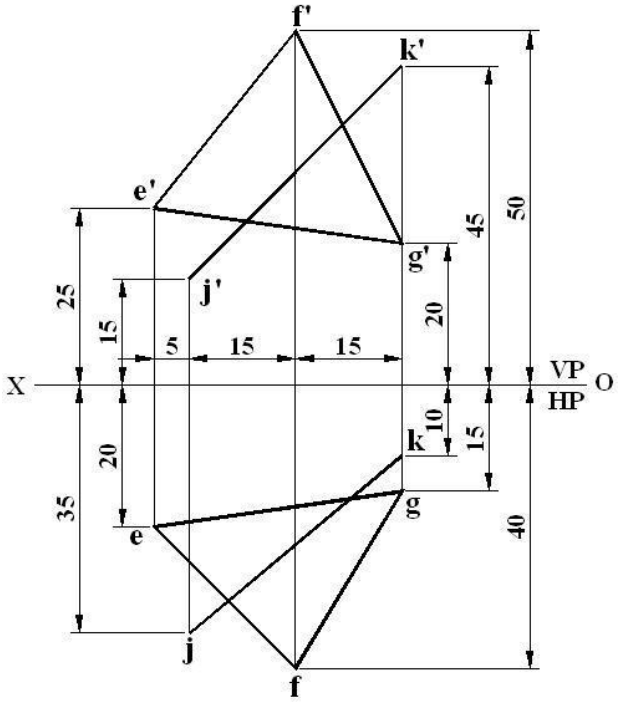


Figure 3.15

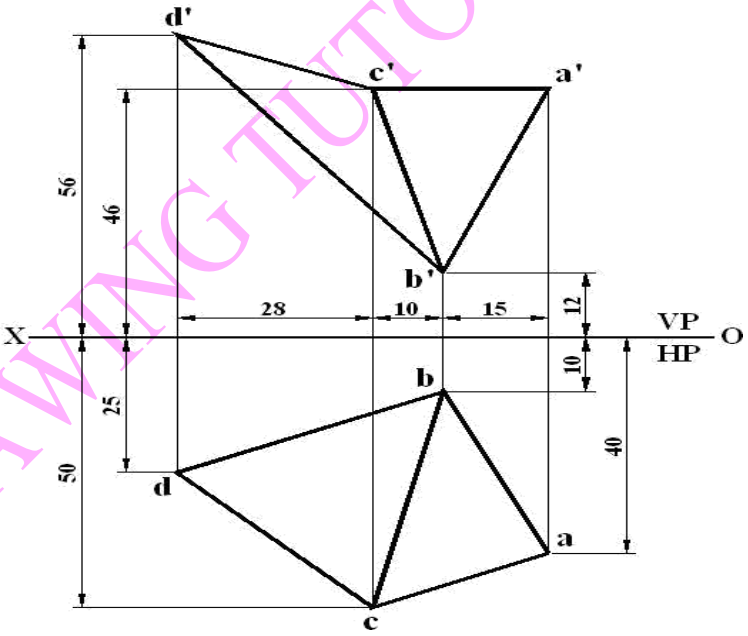


Figure 3.16

ENGINEERING DRAWING
SHEET NO: 4
(ORTHOGRAPHIC PROJECTIONS)

1. Draw orthographic views of the given objects.

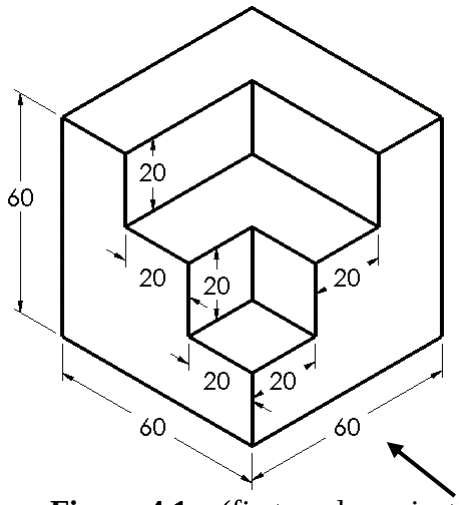


Figure 4.1 a (first angle projection)

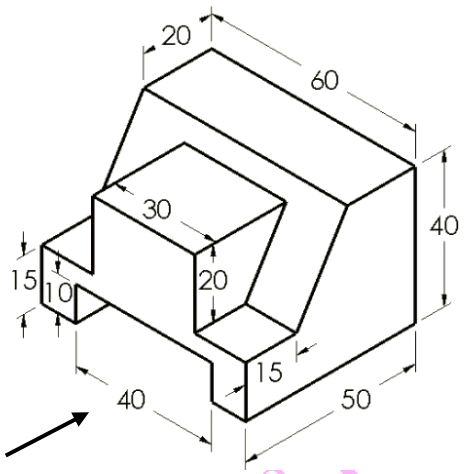


Figure 4.1 b (first angle projection)

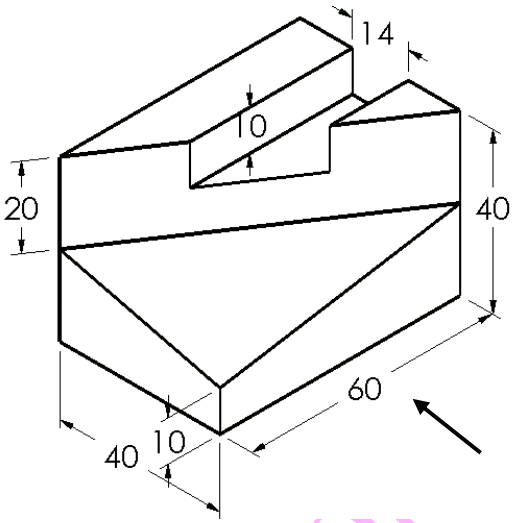


Figure 4.1 c (third angle projection)

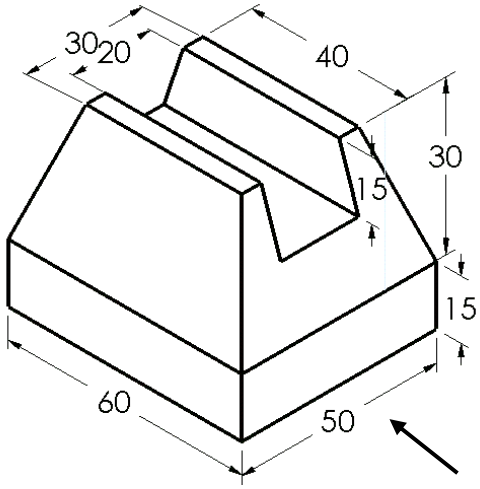


Figure 4.1 d (third angle projection)

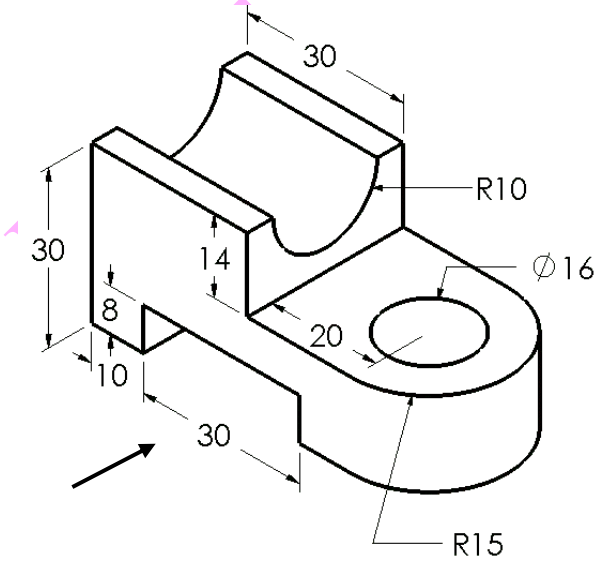


Figure 4.1 e (third angle projection)

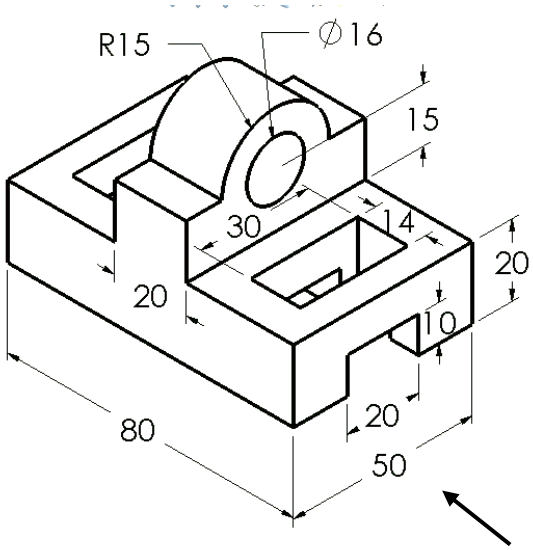


Figure 4.1 f (third angle projection)

ENGINEERING DRAWING
SHEET NO: 5
(ORTHOGRAPHIC SECTIONAL and AUXULIARY VIEWS)

1. Draw the orthographic views of the objects given below with full sectional front view.

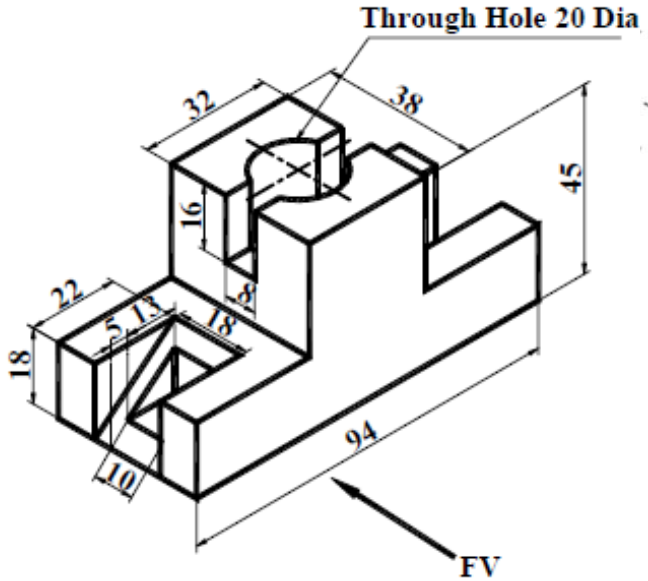


Figure 5.1 a (third angle projection)

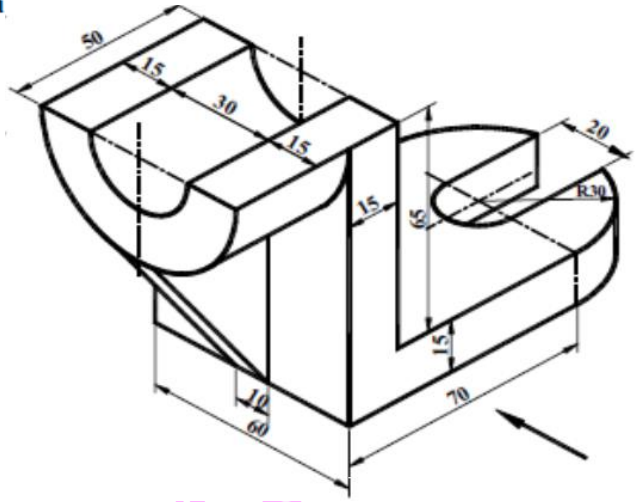


Figure 5.1 b (third angle projection)

2. Draw the orthographic views of the objects given below with full sectional side view.

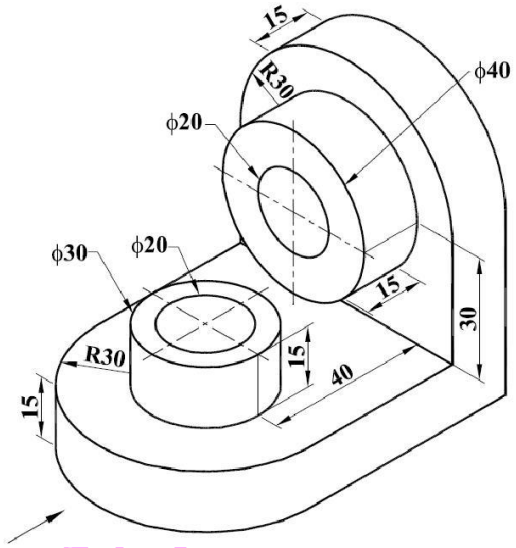


Figure 5.2 a (third angle projection)

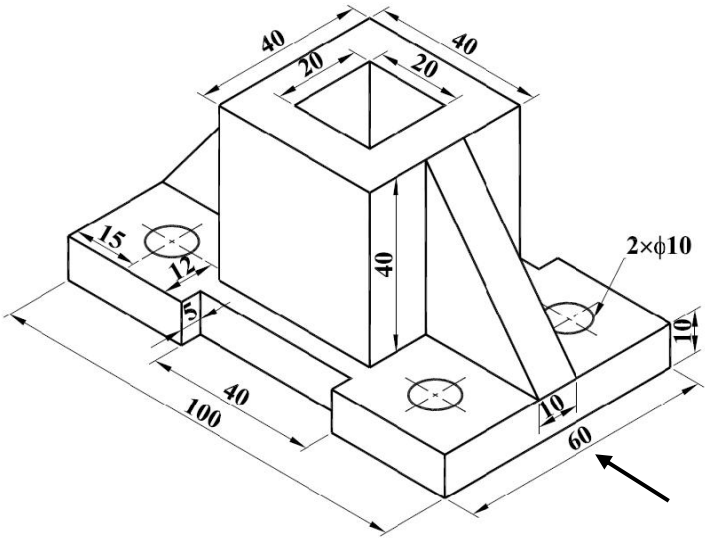


Figure 5.2 b (third angle projection)

3. Draw the orthographic views of the objects given below with full sectional top view.

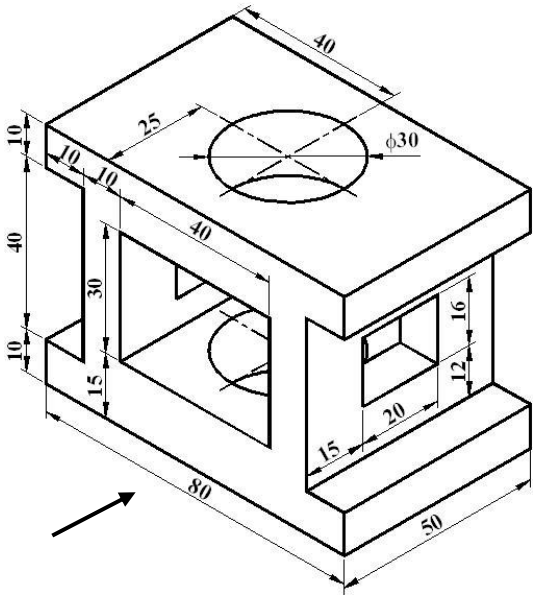


Figure 5.3 a (third angle projection)

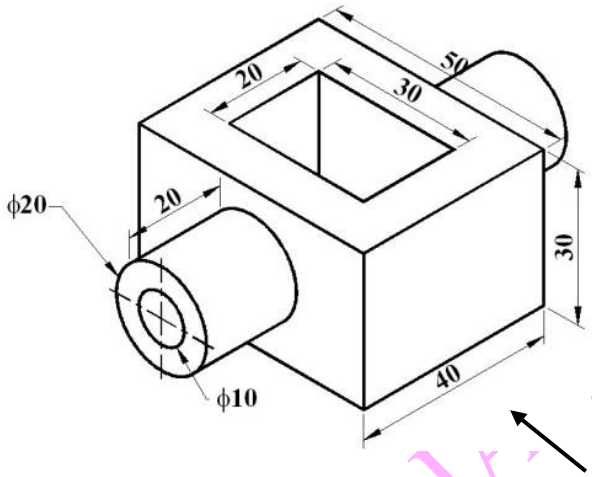


Figure 5.3 b (third angle projection)

4. Draw the orthographic views of the objects shown in figures below with half sectional front view and half sectional side view.

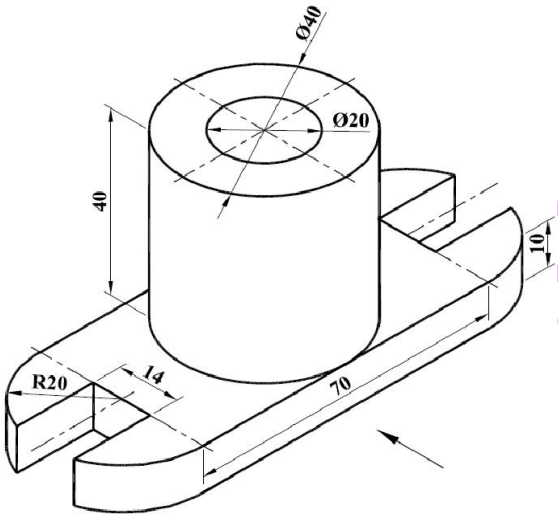


Figure 5.4 a

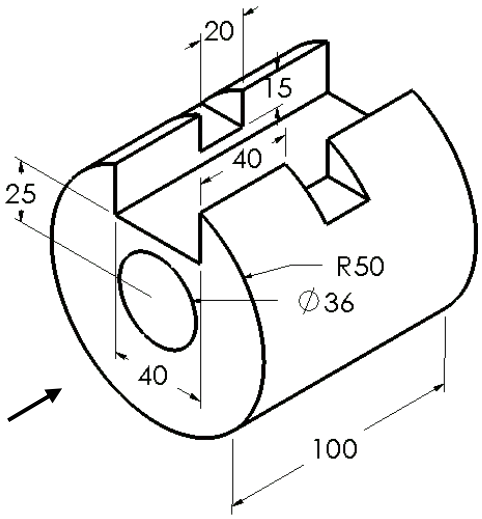


Figure 5.4 b

5. Draw the front view, the top view, and the normal view of the inclined surfaces for the object given below.

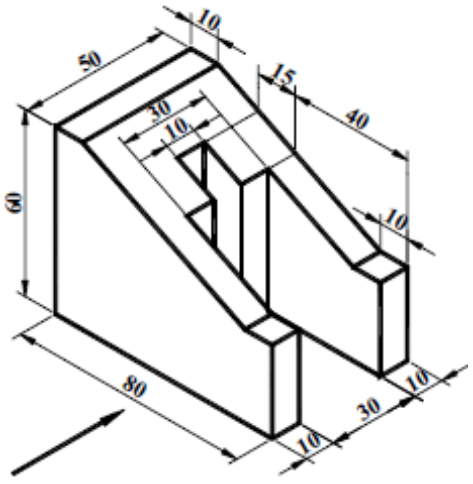


Figure 5.5 (first angle projection)

ENGINEERING DRAWING
SHEET NO: 6
(DEVELOPMENT OF SURFACES)

Make a complete orthographic drawing of a geometrical solid cut by a plane/planes. Find the true shape of the section/sections. Construct the development of the surface of the solid.

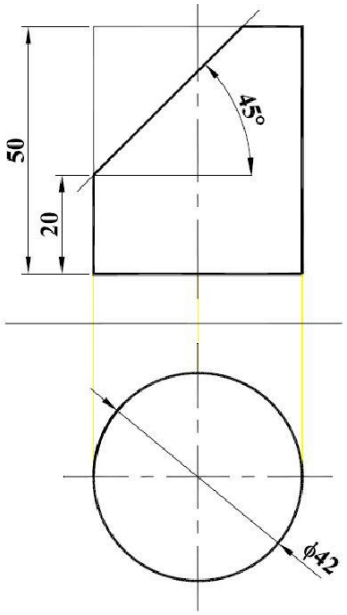


Figure 6 a

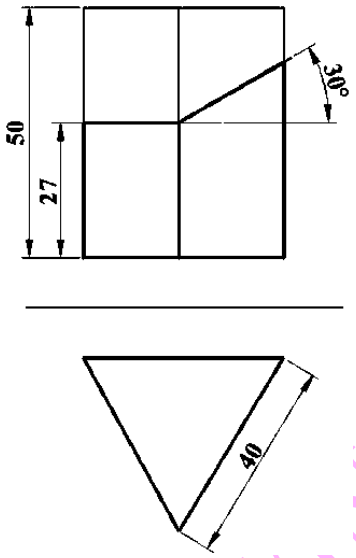


Figure 6 b

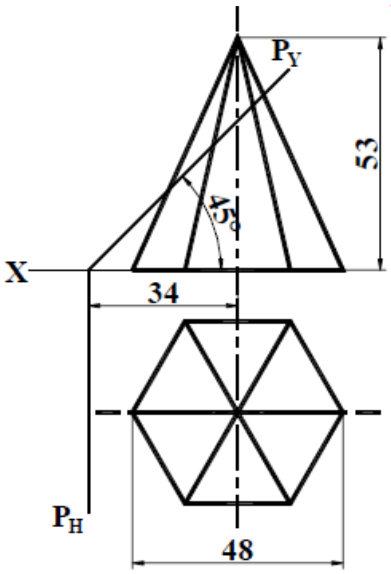


Figure 6 c

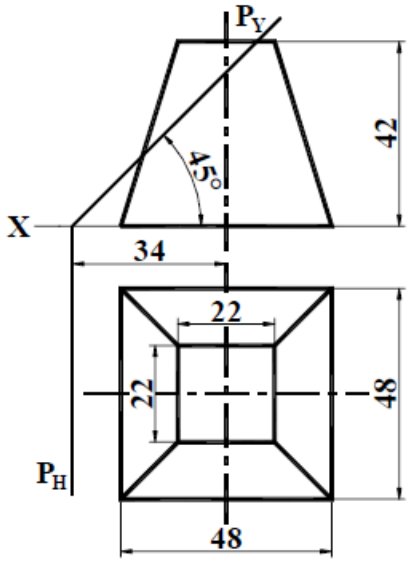


Figure 6 d

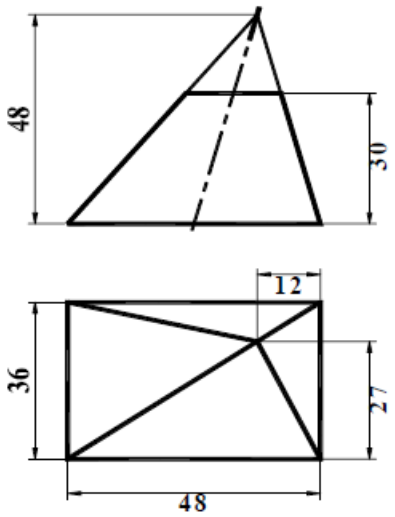


Figure 6 e

ENGINEERING DRAWING
SHEET NO: 7
(INTERSECTION OF SOLIDS)

Draw the given views of assigned form and complete the intersection curve.

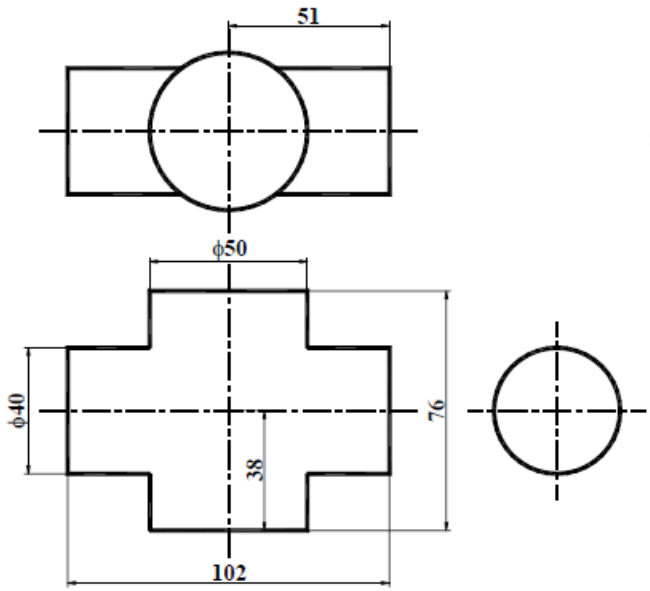


Figure 7 a

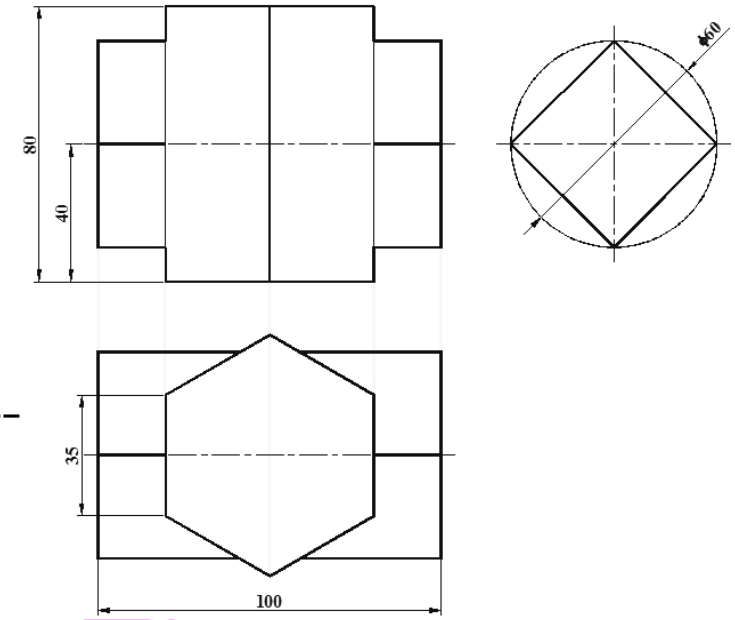


Figure 7 b

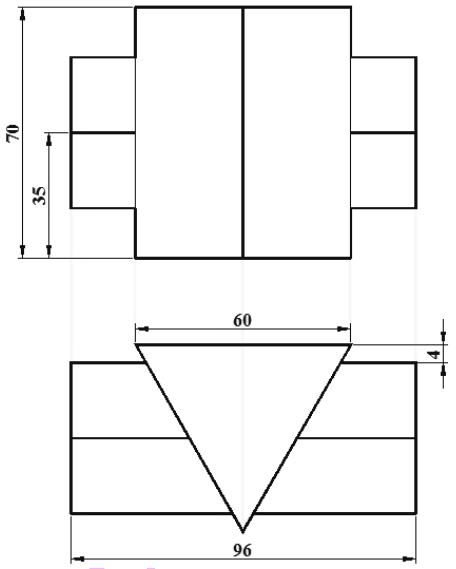


Figure 7 c

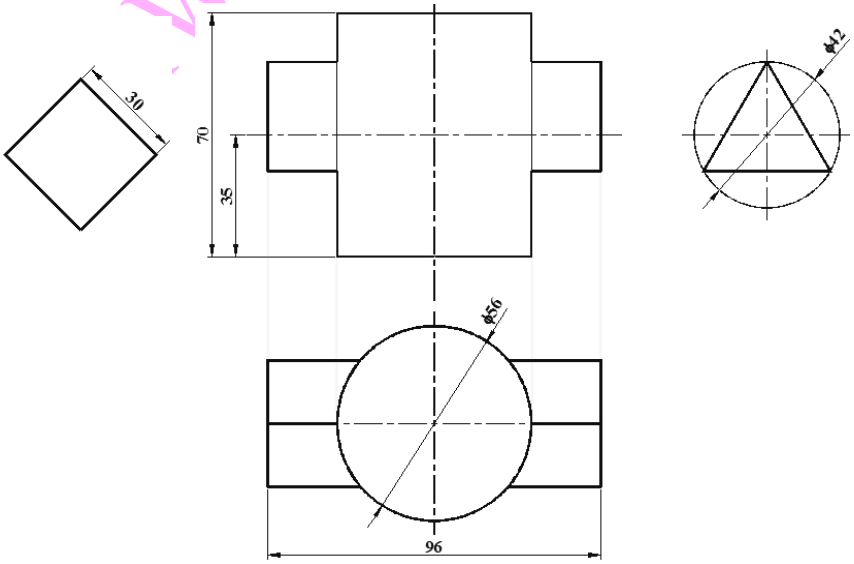


Figure 7 d

ENGINEERING DRAWING
SHEET NO: 7
(INTERSECTION OF SOLIDS)

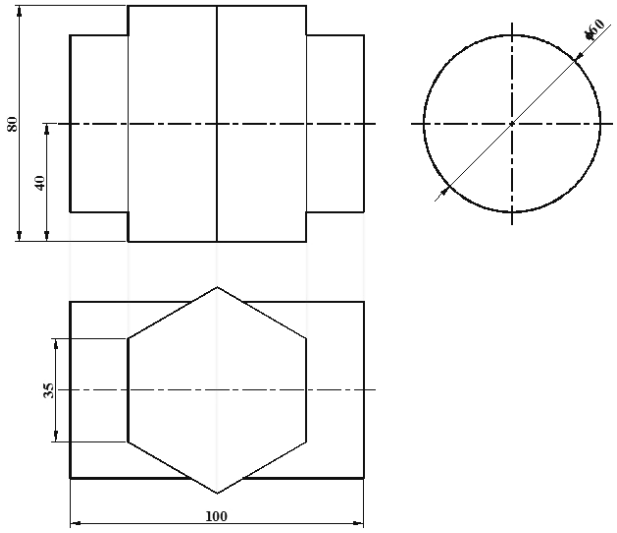


Figure 7 e

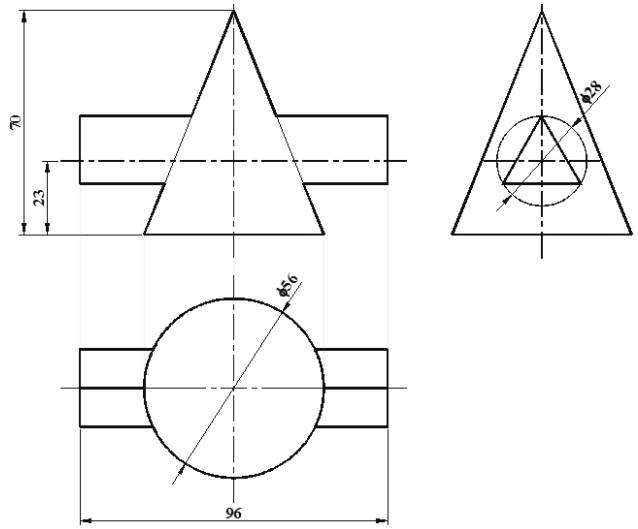


Figure 7 f

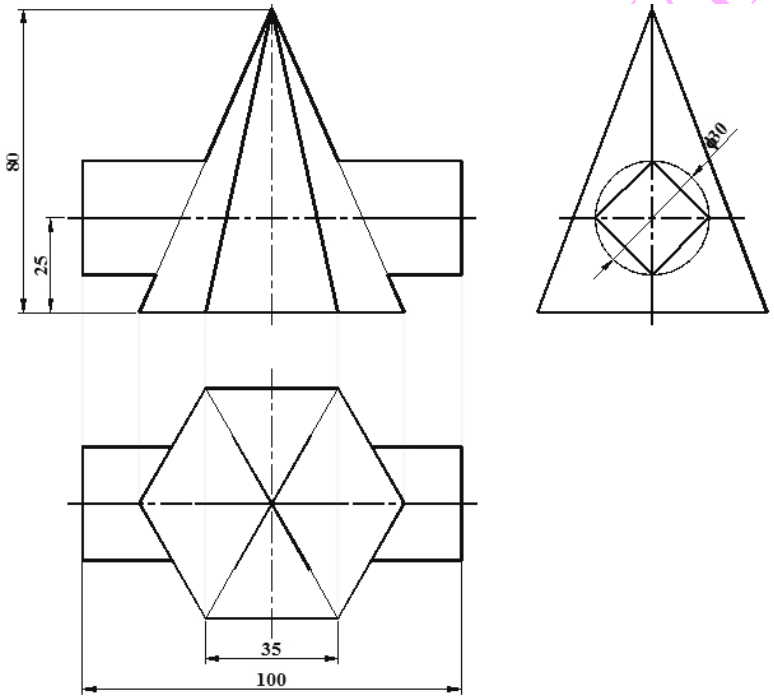


Figure 7 g

ENGINEERING DRAWING
SHEET NO: 8
(ISOMETRIC DRAWING)

1. Draw the isometric drawing from the given orthographic views in figures.

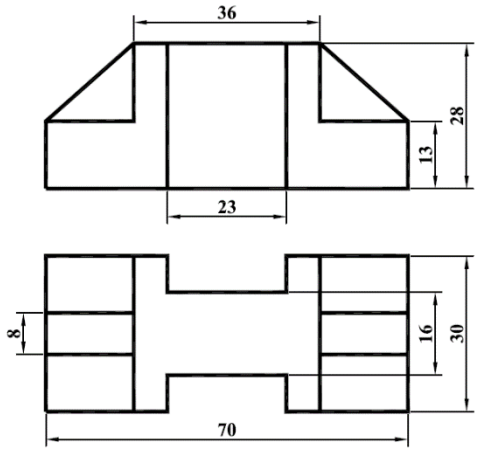


Figure 8.1 a

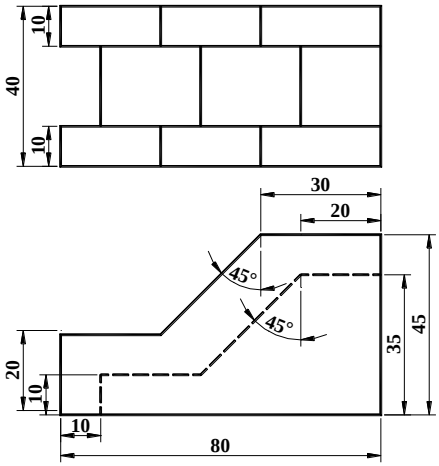


Figure 8.1 b

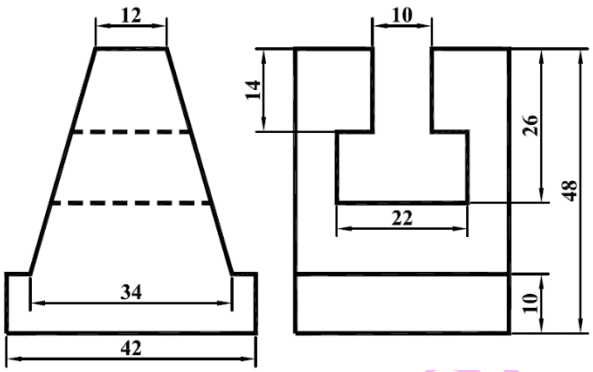


Figure 8.1 c

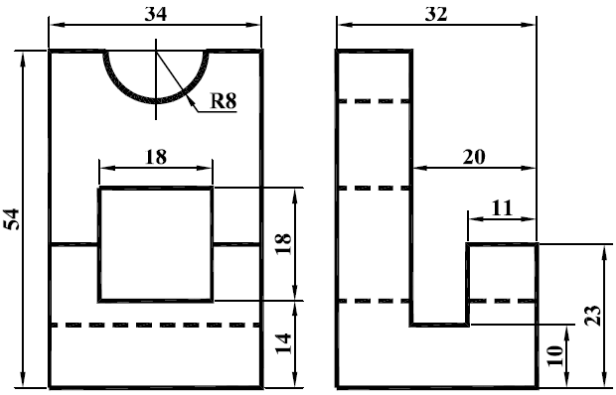


Figure 8.1 d

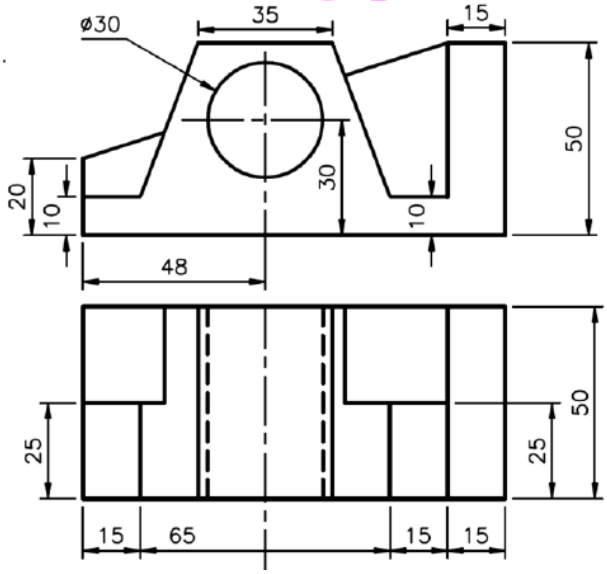


Figure 8.1 e

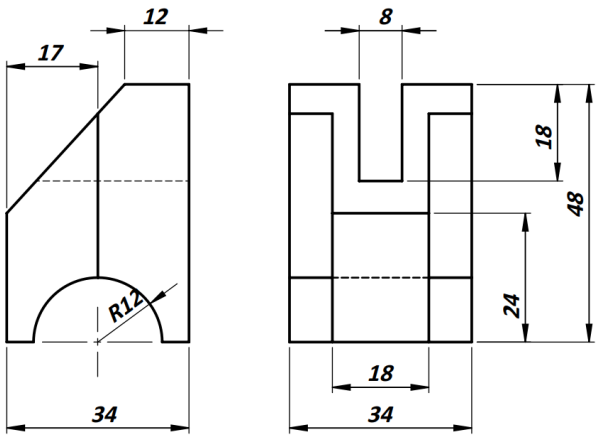


Figure 8.1 f

ENGINEERING DRAWING
SHEET NO: 8
(ISOMETRIC DRAWING)

2. Draw the isometric drawing in section from the given sectional views in figure below.

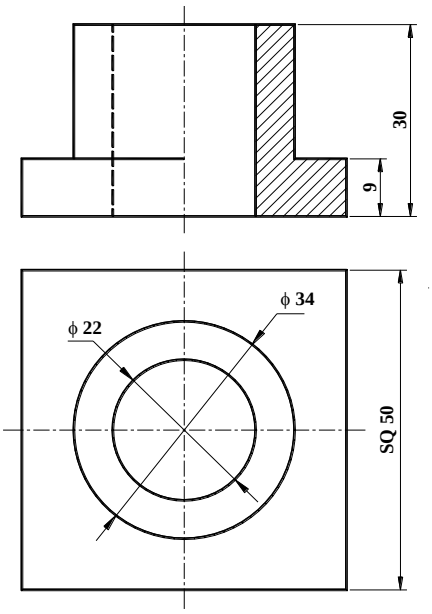


Figure 8.2 a

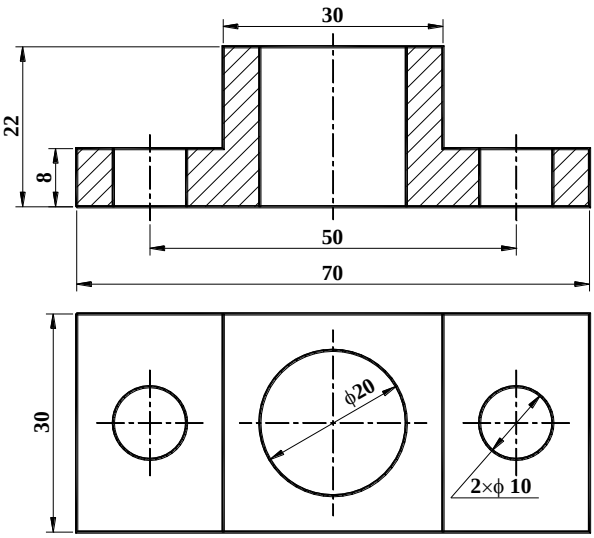


Figure 8.2 b

3. A cylindrical slab having 75 mm as diameter and 45 mm thickness, is surmounted by a cube of edge 38 mm. On the top of the cube rests a square pyramid of altitude 38 mm and side of base 25 mm. The axes of the solids are in the same straight line. Draw the isomeric view of the combination of these solids.
4. A cube of sides 60mm is resting on the ground and a frustum of a square pyramid of base side 45 mm, top base side 25 mm and height 50 mm on its top with a vertical common straight line. A sphere of diameter 40mm is placed on top of the frustum. Draw the isometric view of the solids.

ENGINEERING DRAWING
SHEET NO: 9
(OBLIQUE DRAWING AND PERSPECTIVE PROJECTION)

1. Draw an oblique drawing of the object with given orthographic views.

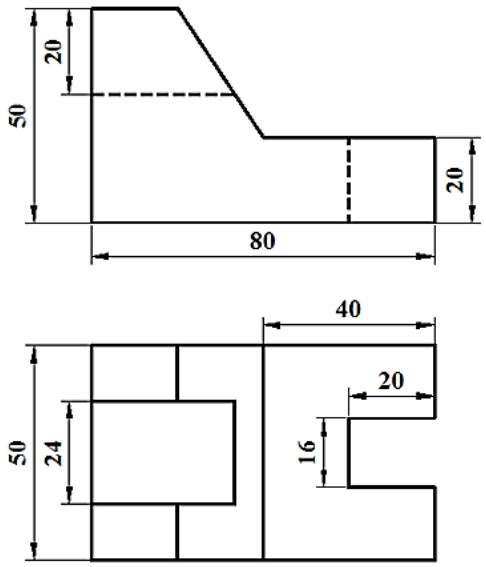


Figure 9.1 a

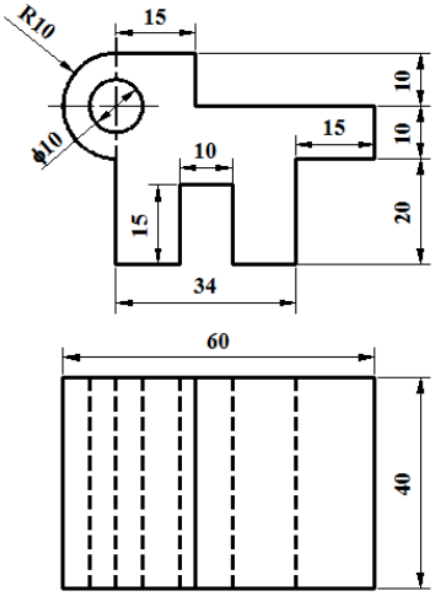


Figure 9.1 b

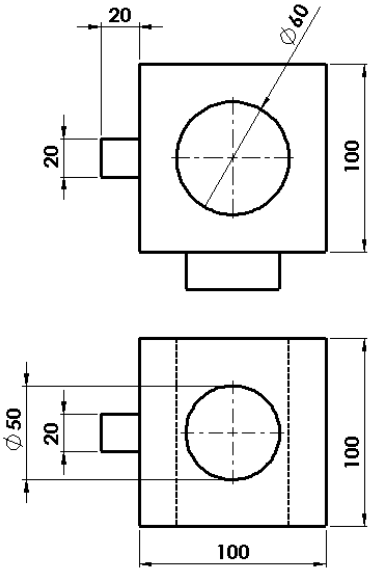


Figure 9.1 c

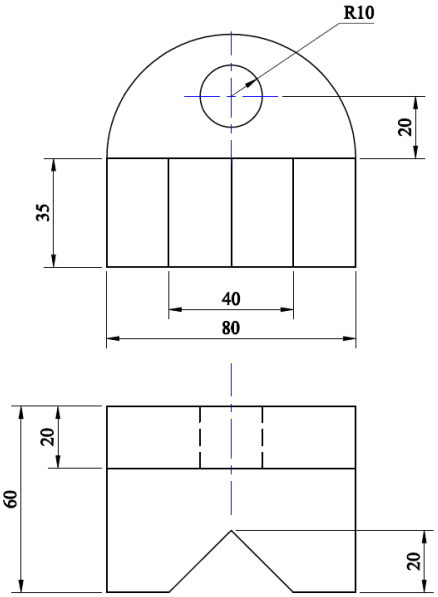
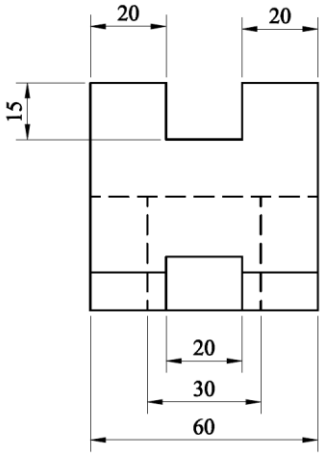


Figure 9.1 d



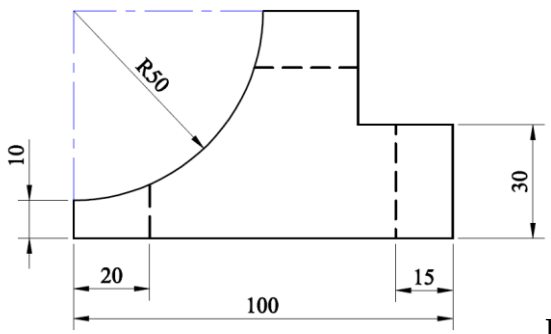


Figure 9.1 e

ENGINEERING DRAWING
SHEET NO: 9
(OBLIQUE DRAWING AND PERSPECTIVE PROJECTION)

2. Draw the parallel perspective projection (Figure 9.2 a) and the angular perspective projection (Figure 9.2 b) from the given orthographic views.

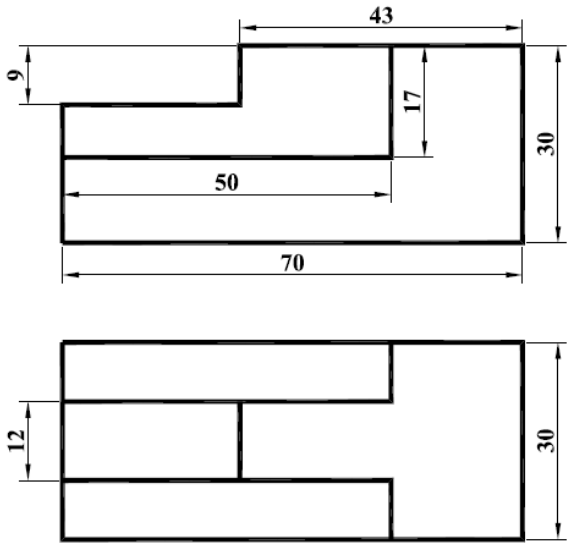


Figure 9.2 a

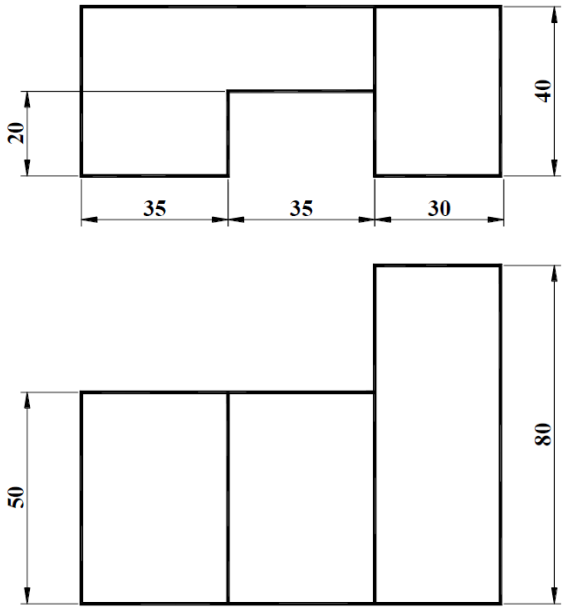


Figure 9.2 b

3. A square prism of side base 25 mm and height 30 mm rests with its base on the ground and one of the rectangular faces inclined at 30^0 to the picture plane. The nearest vertical edge touches the PP. The station point is 40 mm in front of the PP, 50 mm above the ground and opposite to the nearest vertical edge that touches the PP. Draw the perspective view of the prism.
4. Draw the perspective view of a **square pyramid** of base 30 mm (side) and height of apex 45 mm. The nearest edge of the base is parallel to and 20 mm behind the picture plane. The station point is situated at a distance of 70 mm in front of the **PP** and 40 mm to the right of the axis of the pyramid and 60 mm above the ground.

ENGINEERING DRAWING
SHEET NO: 10
(SECTIONAL VIEWS)

1. Draw and dimension three projections of a model with a vertical section.

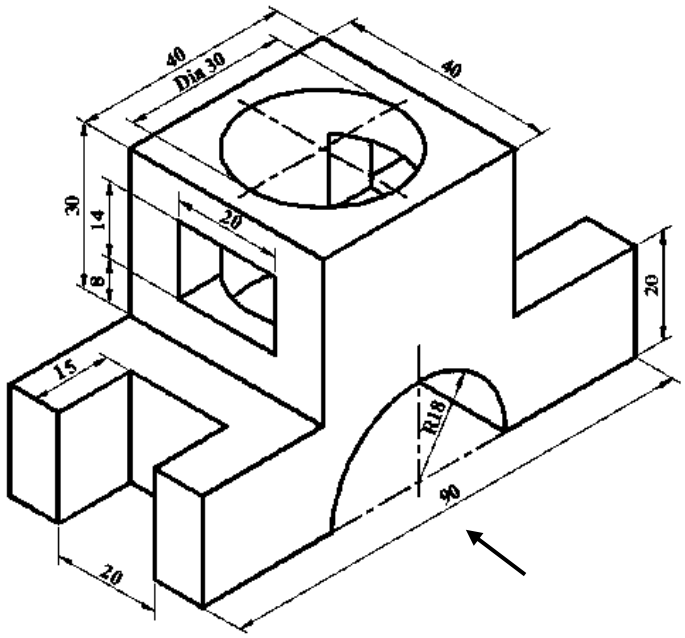


Figure 10.1 a

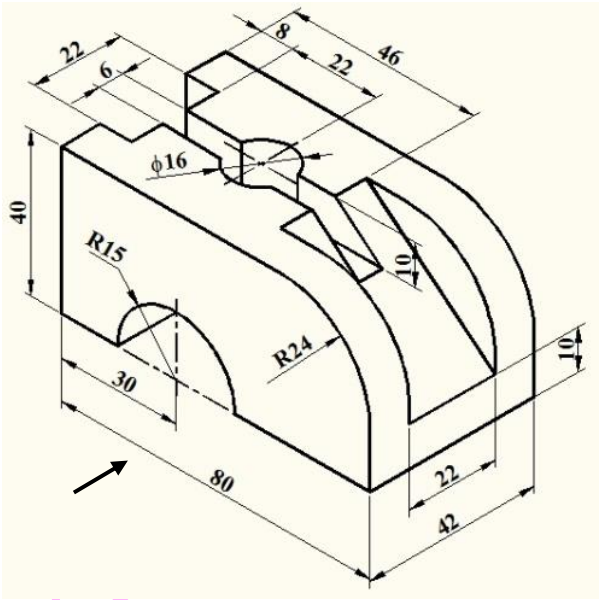


Figure 10.1 b

2. Draw full sectional front view from the given views in Figure 10.2.
3. Draw offset sectional view at A-A from the given views in Figure 10.3.
4. Draw auxiliary sectional view at A-A from the given views in Figure 10.4.
5. Draw sectional front view and top view of the objects shown in Figure 10.5. Use convention for the radially arranged holes, ribs and spokes.

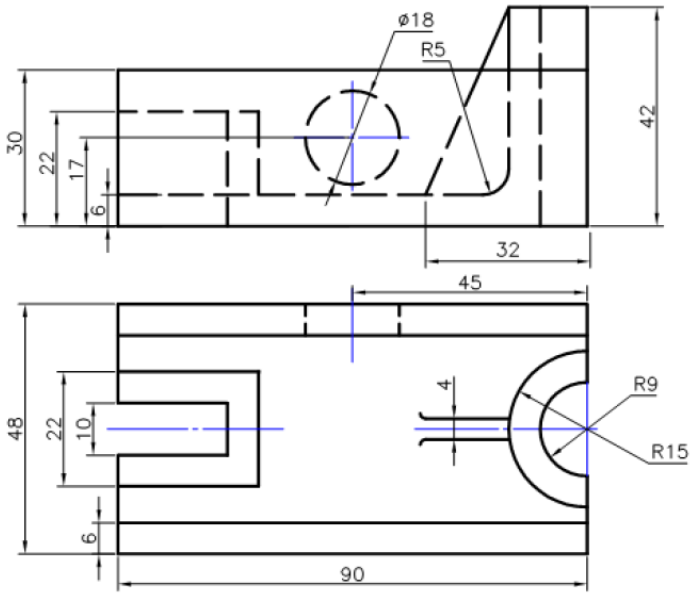


Figure 10.2

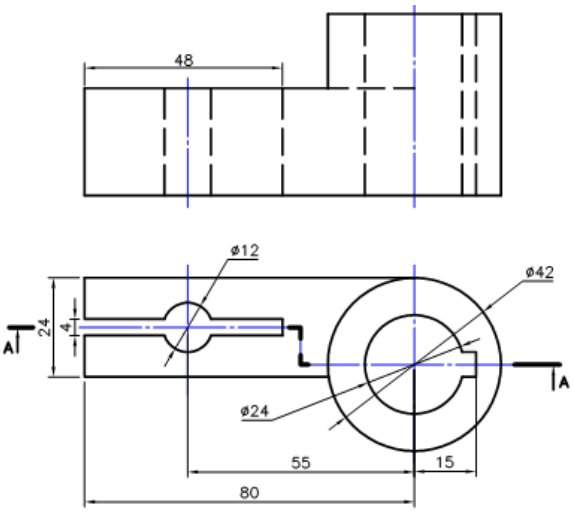


Figure 10.3

ENGINEERING DRAWING
SHEET NO: 10
(SECTIONAL VIEWS)

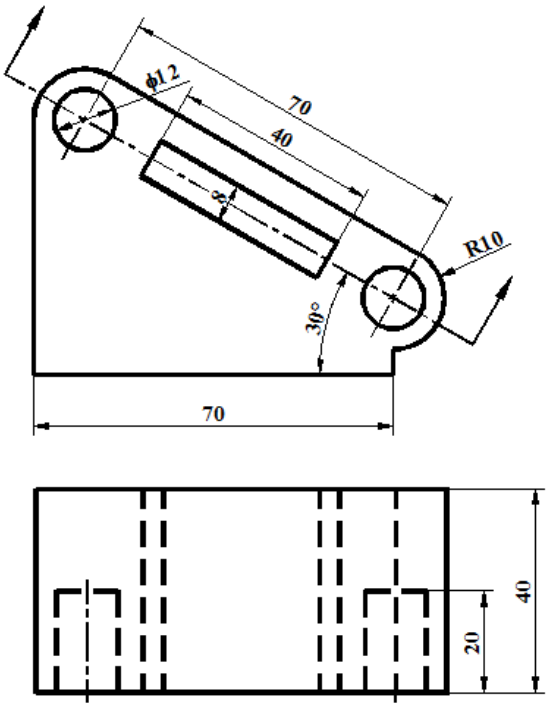


Figure 10.4

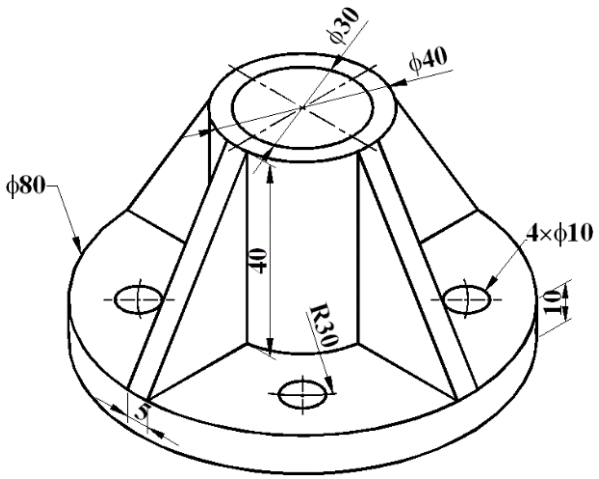


Figure 10.5