POKHARA UNIVERSITY

Faculty of Science and Technology

School of Engineering

ENGINEERING DRAWING

TUTORIAL SHEETS

for all BE

SHEET NO: 1

TECHNICAL LETTERING AND DIMENSIONING

1. Write down alphabets (A to Z) of different size using drawing tools in
- **a)** Vertical capital
- **b)** Inclined capital
- **c)** Vertical small, and
- **d)** Inclined small letters

2. Write down vertical and inclined numerals (0 to 9) and fractions different size.

3. Draw the following lines with 150 mm length
- **a)** Visible outline
- **b)** Hidden
- **c)** Center
- **d)** Projection
- **e)** Cutting plane
- **f)** Break

4. Dimension the following figures. Size may be obtained by measuring the drawing.

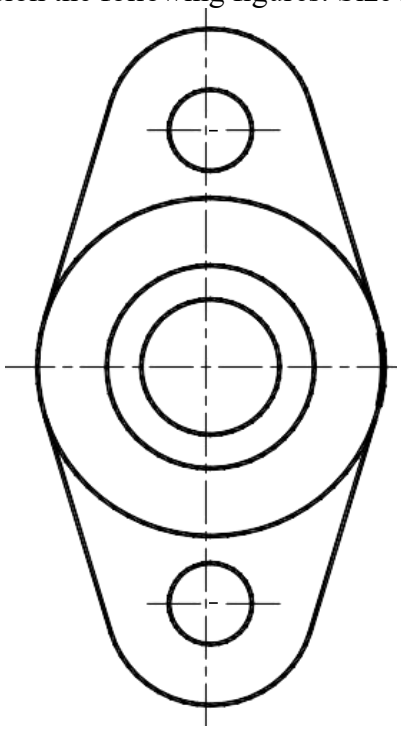


Figure T1.4 (a)

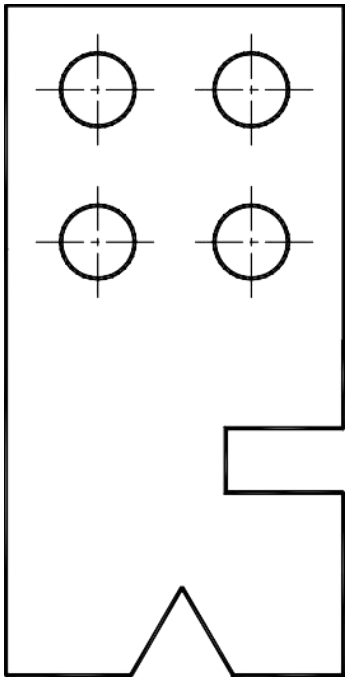


Figure T1.4 (b)

SHEET NO: 2

GEOMETRIC CONSTRUCTION

1. Draw a line 90 mm long and trisect it.
2. Draw a line 110 mm long and divide it into 12 equal parts.
3. Draw a line 80 mm long and divide it in the proportion of 1:2:3.
4. Draw a regular pentagon with each side 30 mm long.
5. Draw a regular hexagon on a circumscribing circle of 90 mm diameter.
6. Draw a regular octagon inscribed on a circle of 76 mm diameter.
7. Construct a regular hexagon with 68 mm distance across flats.
8. Construct a regular octagon with 76 mm distance across corners.
9. Draw two circles with radii 30 mm and 40 mm respectively with their centers lying on a horizontal line and 90 mm apart. Draw internal and external line tangents to the circles.
10. Construct an ellipse when the distance of the focus from its Directrix is equal to 50 mm and eccentricity is 2/3.
11. Draw an ellipse with major and minor axes of 90 mm and 60 mm respectively by using
a) Concentric circle method **b)** Four center method
12. Construct a parabola when the distance of the focus from the Directrix is equal to 50 mm.
13. Draw a parabola with axis length of 60 mm and double ordinate of 80 mm using
a) Rectangle method **b)** Tangent method
14. Construct a hyperbola when the distance of the focus from the directrix is equal to 50 mm and eccentricity is 3/2.
15. Draw an involute of a hexagon of side 25 mm.
16. Draw an involute of a circle of 40 mm diameter. Also draw a normal and tangent to the point 100 mm from the centre of the circle.
17. Draw the involutes of the plane figures shown in **Figure T2.17**.

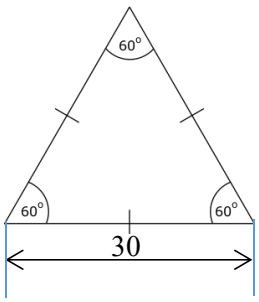


Figure T2.17 (a)

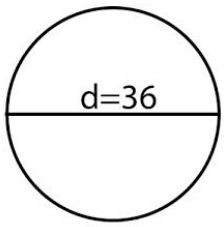


Figure T2.17 (b)

18. A circle of 50 mm diameter rolls along a straight line without slipping. Draw the curve traced out by a point P on the circumference for one complete revolution of the circle. The curve is Cycloid.
19. Construct an Archimedean spiral for convolution with a pitch of 40 mm.
20. Draw a helix for one convolution on a cylinder of 50 mm diameter and 100 mm pitch.

SHEET NO: 3

DESCRIPTIVE GEOMETRY I

(Only for BE Civil and Civil & Rural)

1. Draw the projections of the following points.
a) Point P, 30 mm in-front of VP and 35 mm above HP.
b) Point Q, 37 mm in-front of VP and in the HP.
c) Point R, 27 mm behind VP and 33 mm above HP.
d) Point S, 40 mm behind VP and in the HP.
e) Point T, 33 mm behind VP and 35 mm below HP.
f) Point U, in the VP and 45 mm below HP.
g) Point V, 25 mm in-front of VP and 30 mm below HP.
h) Point W, in the VP and HP.

2. Draw the projections of the following lines:
a) Line AB, 50 mm long, parallel to HP and VP both, when its distance from HP andVP is 30 mm and 35 mm respectively.
b) Line CD, 50 mm long, perpendicular to HP and 30 mm away from VP, when oneof its extremities nearer to HP is 15 mm away from the HP.
c) Line EF, 50 mm long, contained by HP, and perpendicular to VP, when one of itsextremities is 15 mm away from the VP.
d) Line GH, 55 mm long, parallel to VP and inclined to HP at 35^0, when one of itsends is 20 mm from HP and 25 mm from the VP.
e) Line IJ, 55 mm long, contained by HP and inclined to VP at 50^0, when one of itsends is 20 mm from the VP.
f) Line KL, 45 mm long contained by both the HP and the VP.

3. Draw the projections of the line MN when its end M is 10 mm from HP and 15 mm from VP and end N is 30 mm from HP and 40 mm from VP. Its end projectors are 40 mm apart.

4. The front view of a line, inclined at 30^0 to the VP is 65 mm long. Draw the projections of the line, when it is parallel to and 40 mm above the HP, its one end being 30 mm in front of the VP.

5. A 90 mm long line is parallel to and 25 mm in front of the VP. Its one end is in theHP while the other is 50 mm above the HP. Draw projections and find inclination with the HP.

6. A square lamina ABCD, of 35 mm side is parallel to HP and is 10 mm from it. Itsside nearer to VP is parallel to and 10 mm from VP. Draw its projections.

7. A rectangle ABCD 60 mm 40 mm is parallel to HP with one of its sides inclined at 40^0 to VP and the end of the side near to VP is 15 mm in front of the VP and 30 mm above the HP. Draw its projections.

8. A regular pentagon ABCDE 20 mm side has its corner A in HP and the side CD parallel to the HP. Draw its projections when its plane is parallel to and 10 mm from the VP.

9. A square lamina ABCD of 30 mm side is perpendicular to VP and inclined to HP at 45^0. It rests on its side BC in HP. Draw projections when corner point C is 12 mm in front of VP.

10. A regular pentagon ABCDE, of 25 mm side, has its side BC in HP. Its plane is perpendicular to the HP and inclined at 45^0 to the VP. Draw the projections of the pentagon when its corner nearest to VP is 10 mm from it.

11. Draw the projections of a thin circular sheet of 50 mm diameter and negligible thickness, when its plane is inclined at 45^0 to VP and is perpendicular to HP. A point on it circumference and nearest to the VP is 40 mm away from the HP and 14 mm from the VP.

SHEET NO: 4

DESCRIPTIVE GEOMETRY II

(Only for BE Civil and Civil & Rural)

1. A line AB 75 mm long is inclined at 45^0 to the HP and 30^0 to the VP. Its end B is in the HP and 40 mm in front of the VP. Draw its projections.

2. Draw the projections of a line AB, 90 mm long, its midpoint M being 50 mm above the HP and 40 mm in front of the VP. The end A is 20 mm above the HP and 10 mm in front of the VP.

3. The top view of a 75 mm long line measures 65 mm while the length of its front viewis 50 mm. Its one end is in the HP and 12 mm in front of the VP. Draw the projectionsof AB and determine its inclinations with the HP and the VP.

4. A line 65 mm long has its one end 20 mm above the HP and 25 mm in front of theVP. The other end is 40 mm above the HP and 65 mm in front of the VP. Draw the projections of the line and determine its inclinations with the HP and the VP.

5. Orthographic projection of a line is given in **Figure T4.1**. Determine their true lengths and inclinations with the HP using: **a)** Revolution method and **b)** Auxiliary view method

6. Orthographic projection of a line is given in **Figure T4.2**. Determine their true lengths and inclinations with the VP using: **a)** Revolution method and **b)** Auxiliary view method

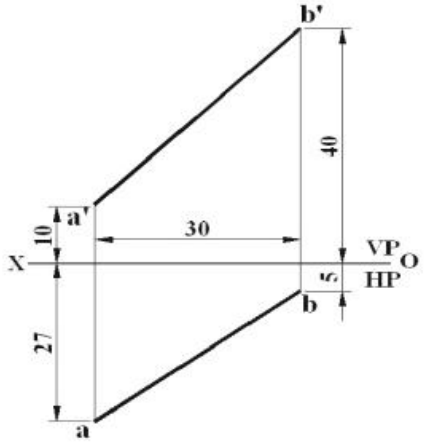


Figure T4.1

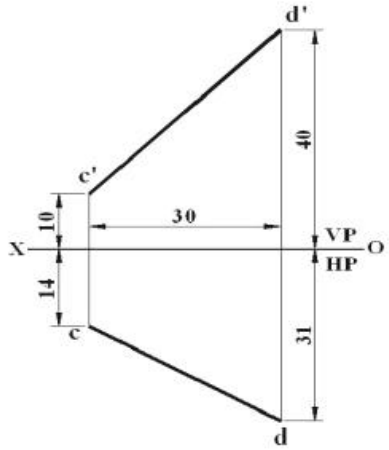


Figure T4.2

7. Determine the shortest distance between the point C and line AB. **(Figure T4.7)**

8. Reproduce the given views of the plane and draw the view showing the true size and shape.

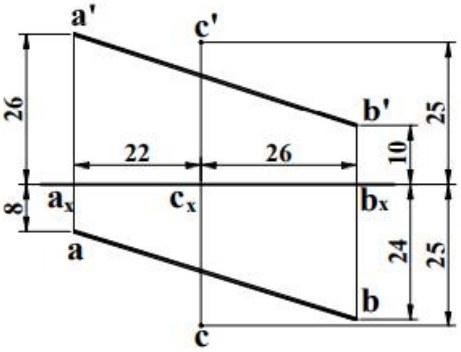


Figure T4.7

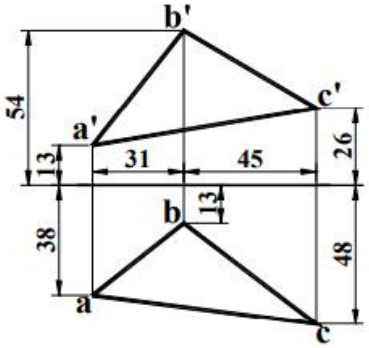


Figure T4.8 (a)

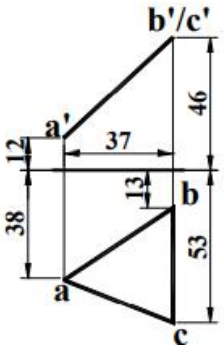


Figure T4.7 (b)

SHEET NO: 5

MULTI-VIEW DRAWINGS

The figures for Problems **T5.1** to **T5.12** contain a number of pictorial views of various shapes. Translated them into three-view orthographic drawing.

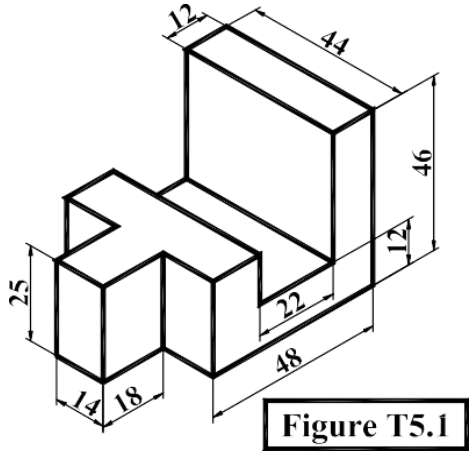


Figure T5.1

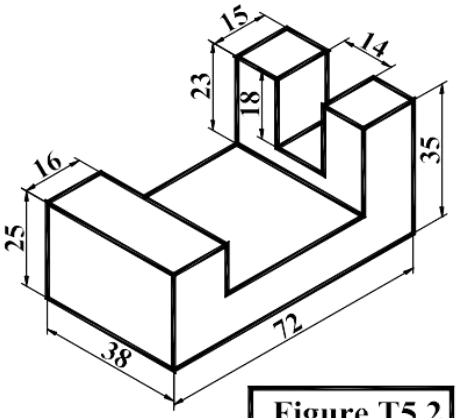


Figure T5.2

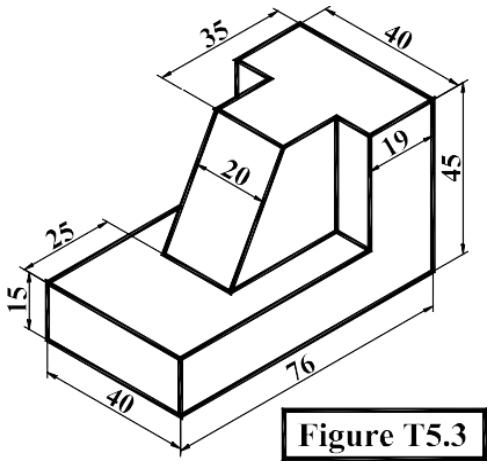


Figure T5.3

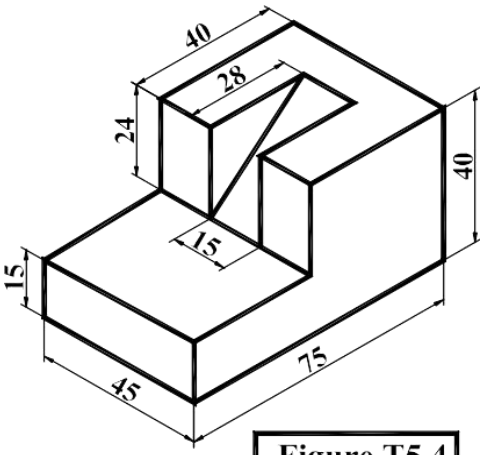


Figure T5.4

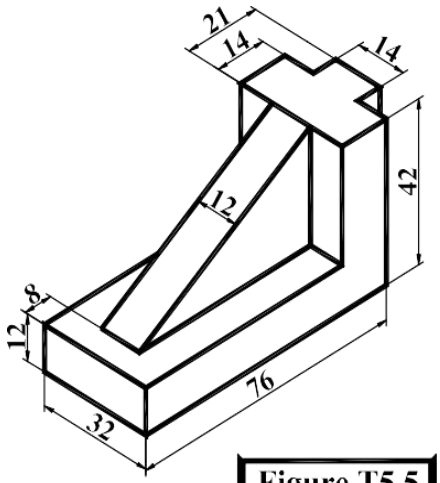


Figure T5.5

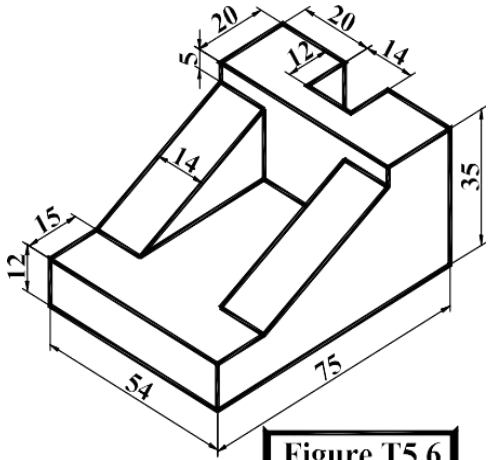


Figure T5.6

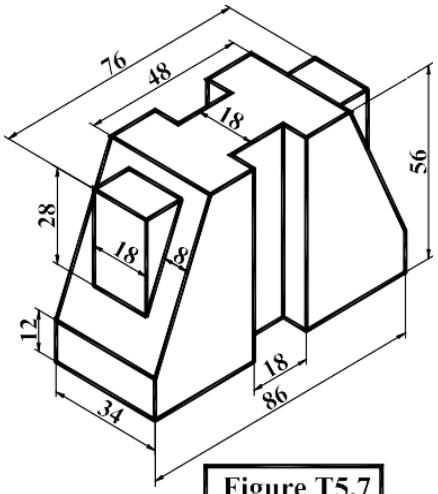


Figure T5.7

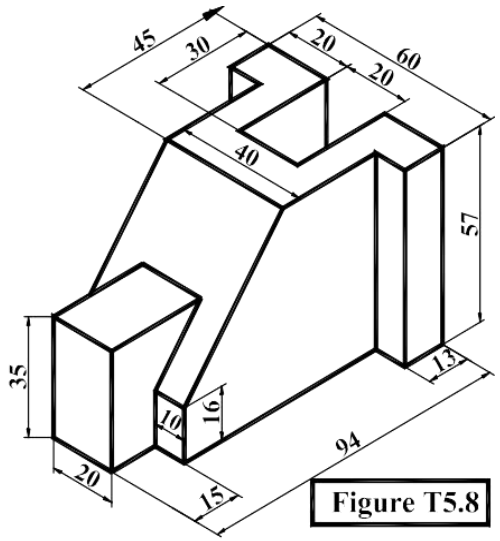


Figure T5.8

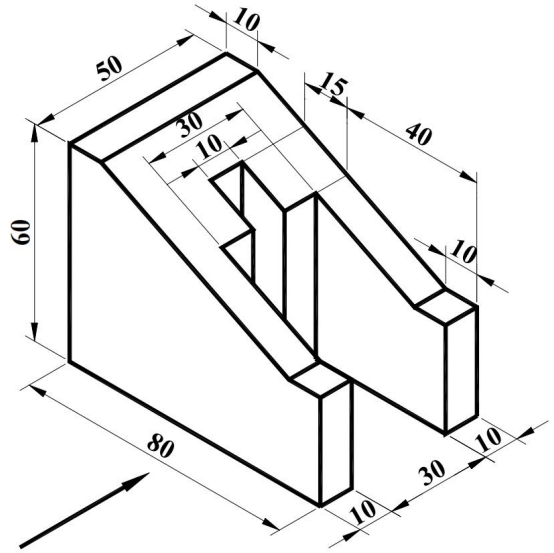


Figure T5.9

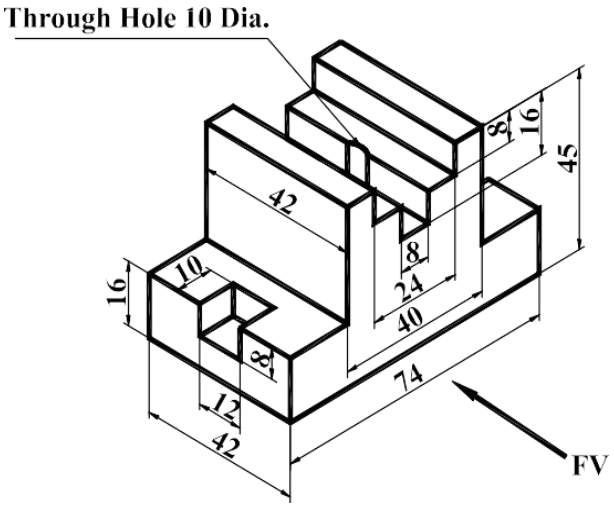


Figure T5.10

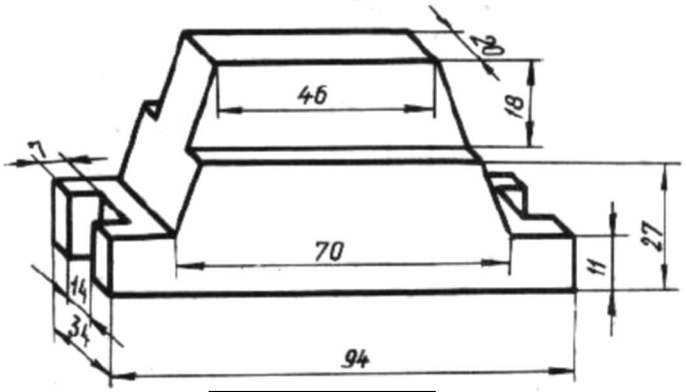


Figure T5.11

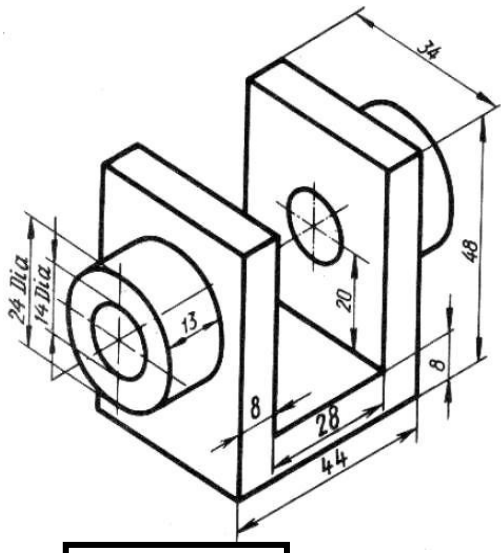


Figure T5.12

SHEET NO: 6

MULTI-VIEW DRAWINGS AND SECTIONAL VIEWS

Make a complete orthographic drawing with full sectional front view (with necessary number of projections) of each model and dimension it.

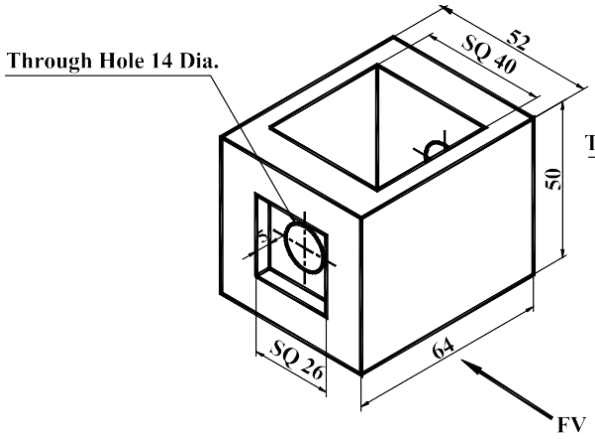


Figure T6.1

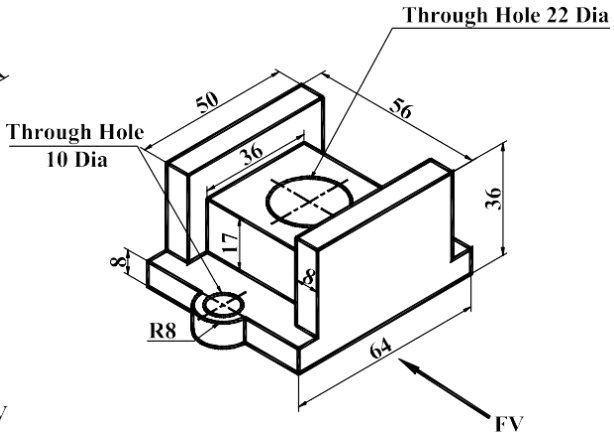


Figure T6.2

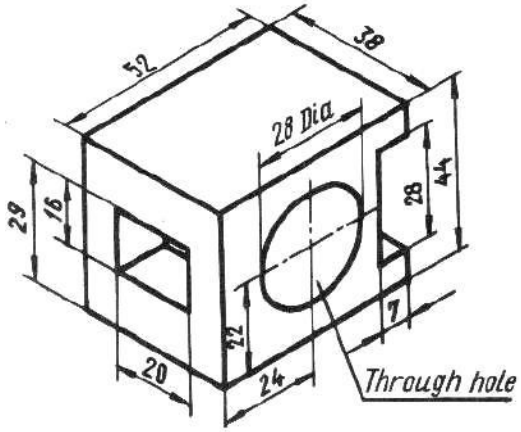


Figure T6.3

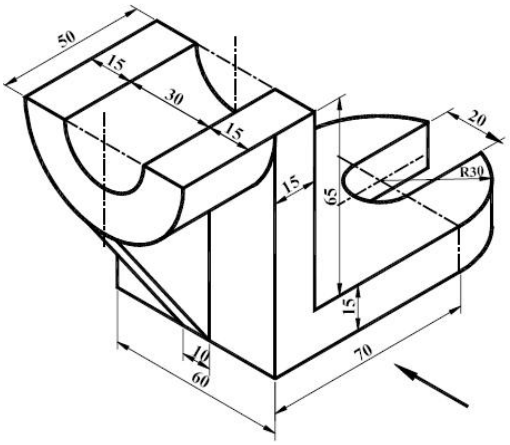


Figure T6.4

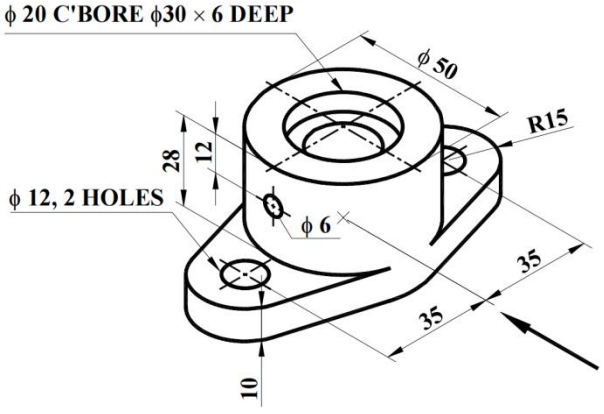


Figure T6.5

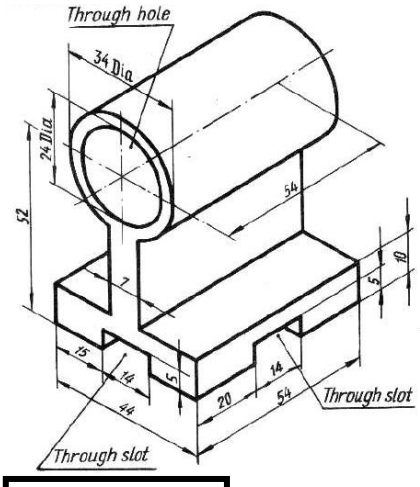


Figure T6.6

SHEET NO: 7

DEVELOPMENT OF SURFACES

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

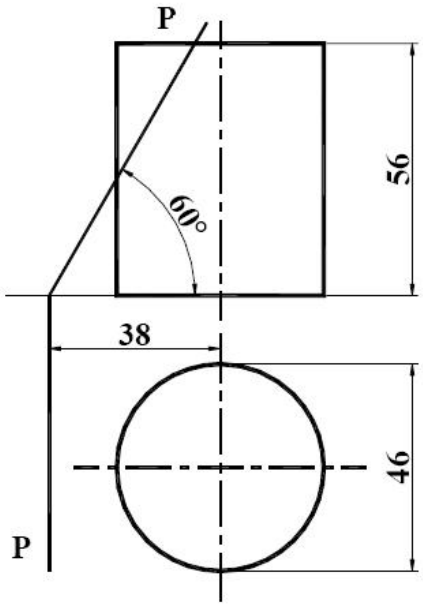


Figure T7.1

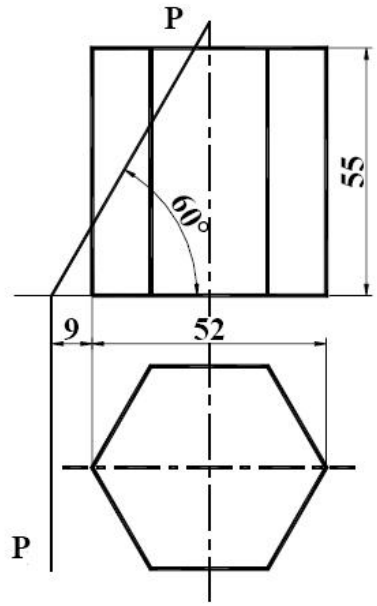


Figure T7.2

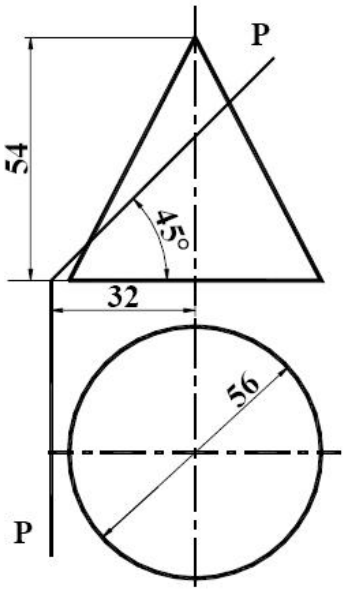


Figure T7.3

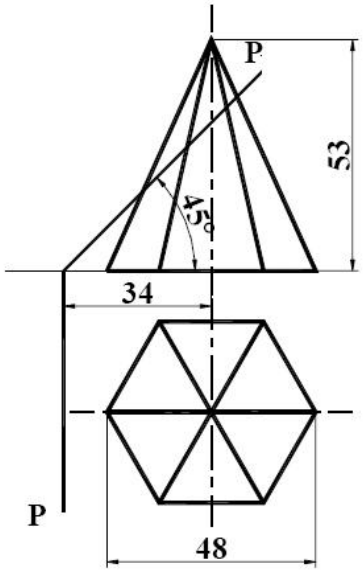


Figure T7.4

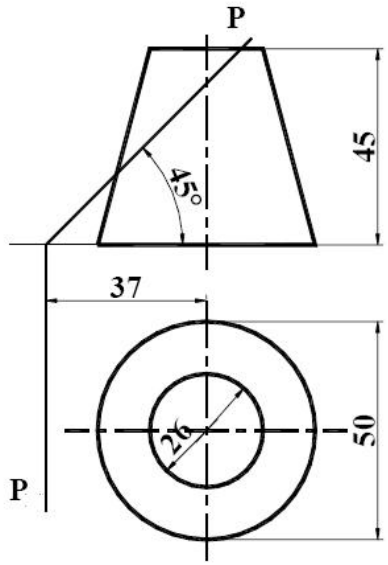


Figure T7.5

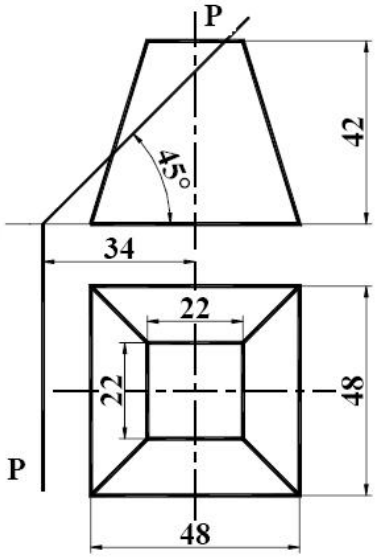


Figure T7.6

SHEET NO: 8

INTERSECTION OF SOLIDS

(Only for BE Civil and Civil & Rural)

Draw the given views of assigned form and complete the intersection. Then develop the lateral surfaces.

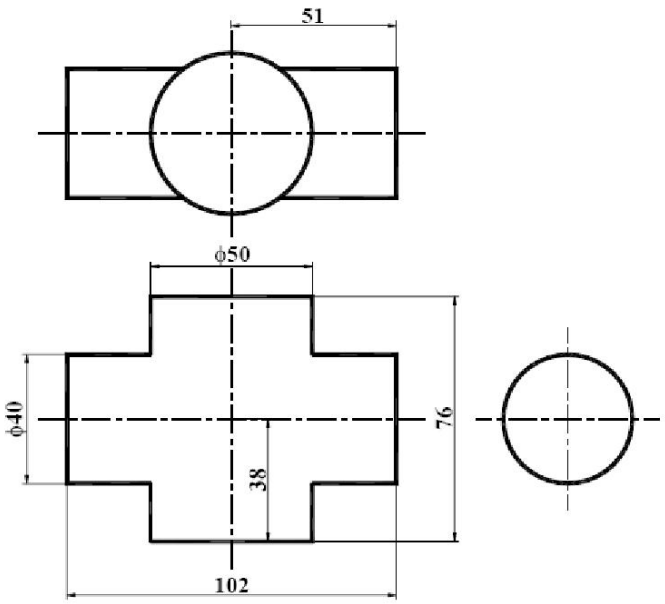


Figure T8.1

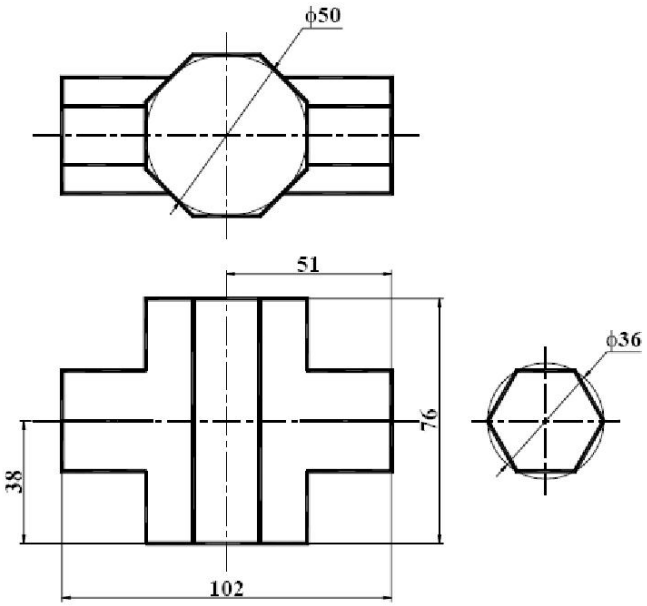


Figure T8.2

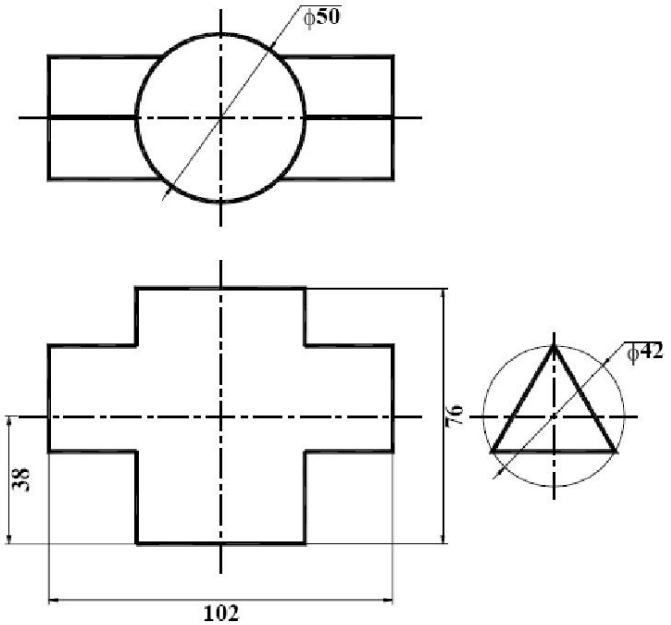


Figure T8.3

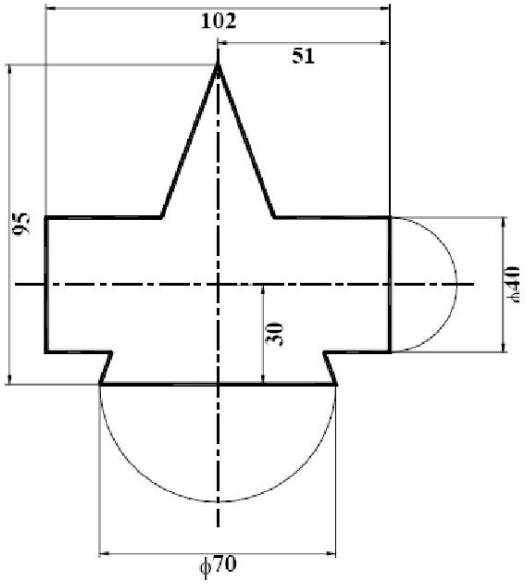


Figure T8.4

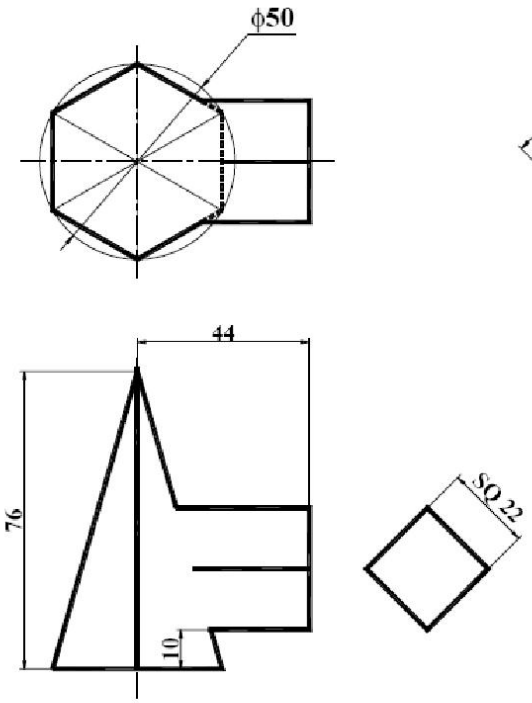


Figure T8.5

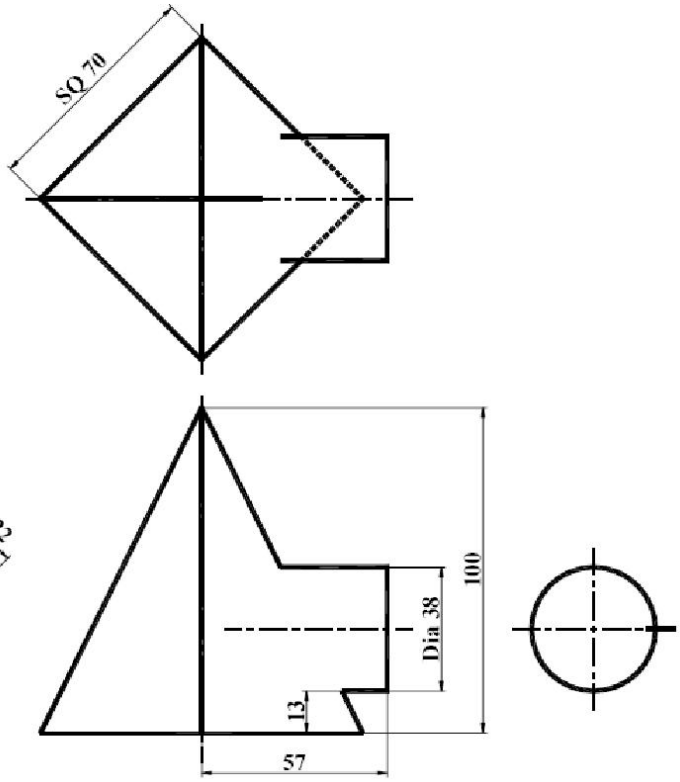


Figure T8.6

SHEET NO: 9

ISOMETRIC DRAWINGS

Draw an isometric Drawing of the following orthographic drawing.

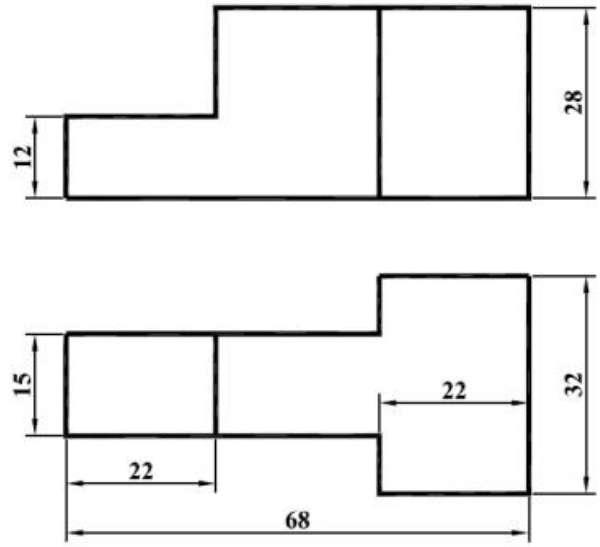


Figure T9.1

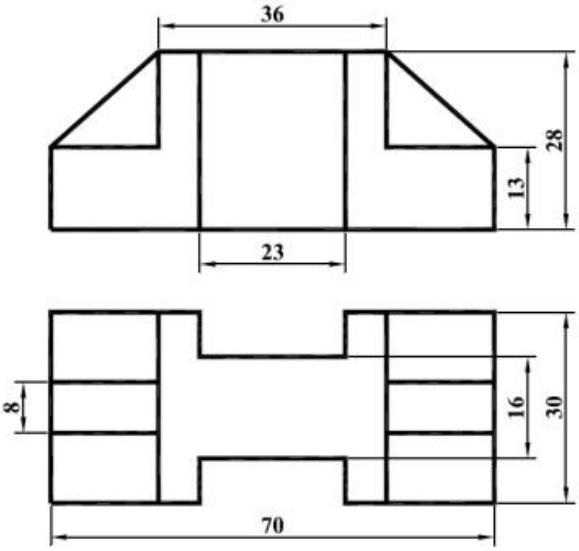


Figure T9.2

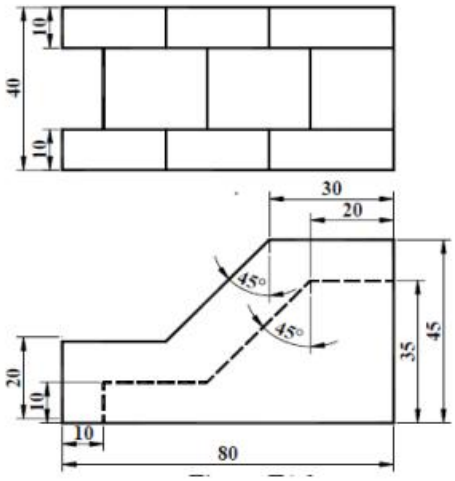


Figure T9.3

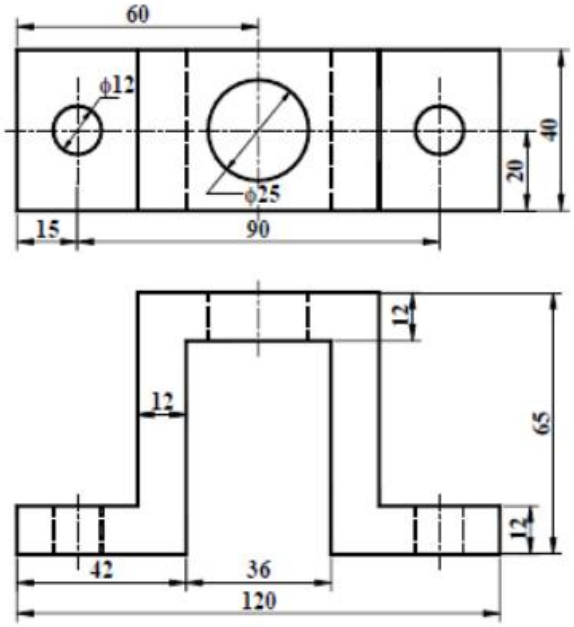


Figure T9.4

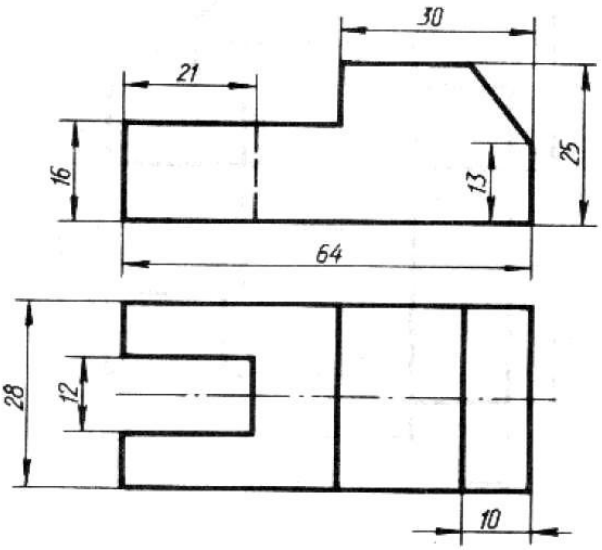


Figure T9.5

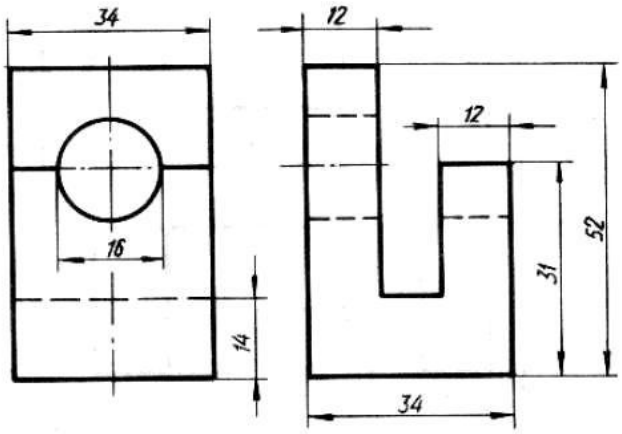


Figure T9.6

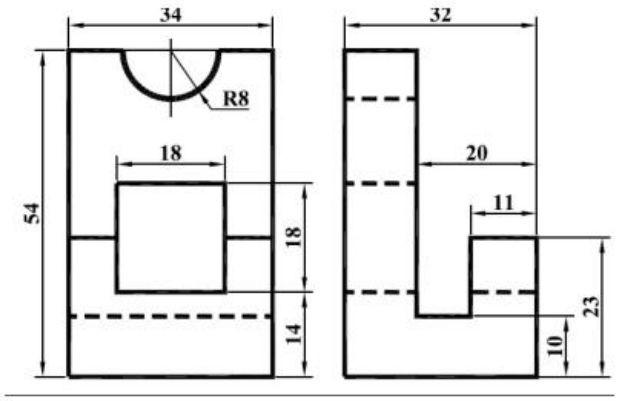


Figure T9.7

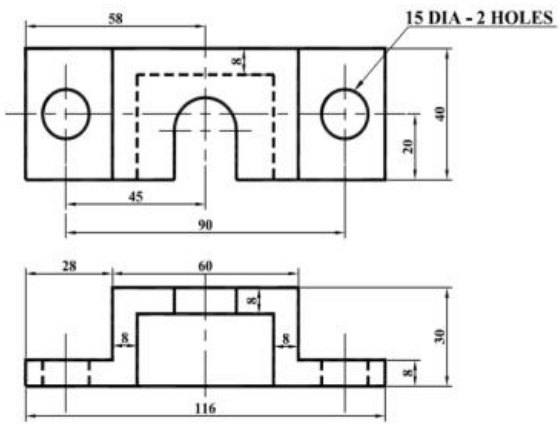


Figure T9.8

Exercise:

1. A cylindrical slab having 60 mm as diameter and 40 mm thickness is surmounted by a cube of edge 40 mm.On the top of the cube rests a square pyramid of altitude 40 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.

2. A sphere of diameter 45 mm rests centrally over a frustum of cone of base diameter 60 mm, top diameter 40 mm and height 60 mm. Draw isometric projections of the combination of solids.

3. A cylindrical slab of 70 mm as diameter and 40 mm thickness is surmounted by a frustum of a square pyramid of base side 45 mm, top base side 25 mm and height 50 mm. The axes of the two solids are on a common straight line. A sphere hemisphere of diameter 40 mm is centrally placed on top of the frustum. Draw the isometric view of the solids.

4. A cube of sides 60mm is resting on the ground. A cylinder of base diameter 50 mm and height 60mm is kept over that. On top of the cylinder, a hexagonal pyramid of side of base 20 mm and altitude 40 mm is kept. The axis of the three solids lies in the same vertical line. Draw the isometric view.

SHEET NO: 10

OBLIQUE DRAWINGS

Draw the Oblique Drawing of the following orthographic Drawings

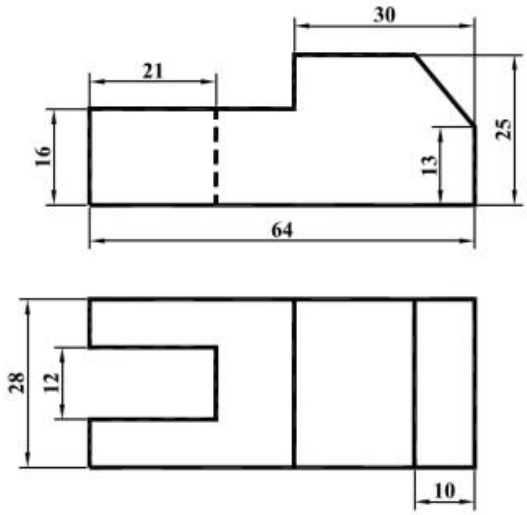


Figure T10.1

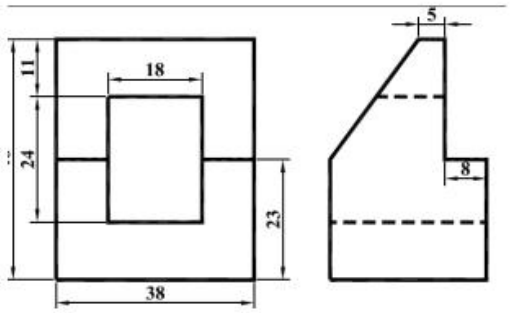


Figure T10.2

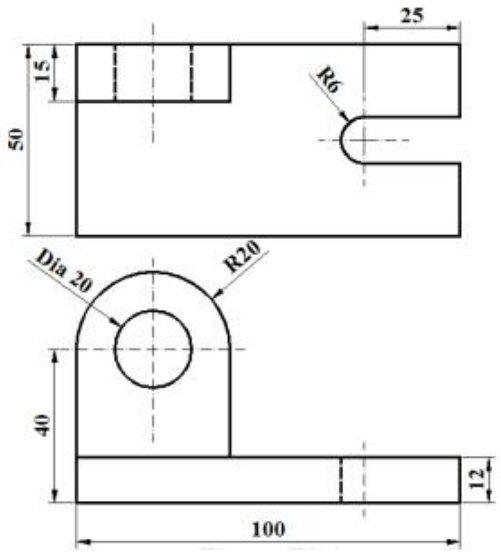


Figure T10.3

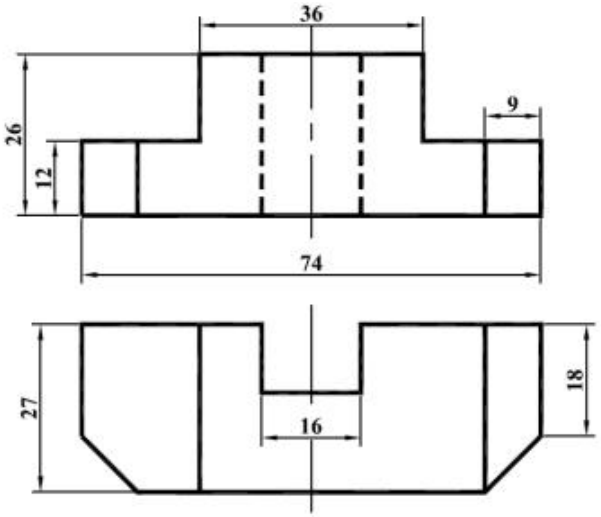


Figure T10.4

SHEET NO: 11

PERSPECTIVES DRAWINGS

Draw the Parallel perspective projection from the given orthographic views.

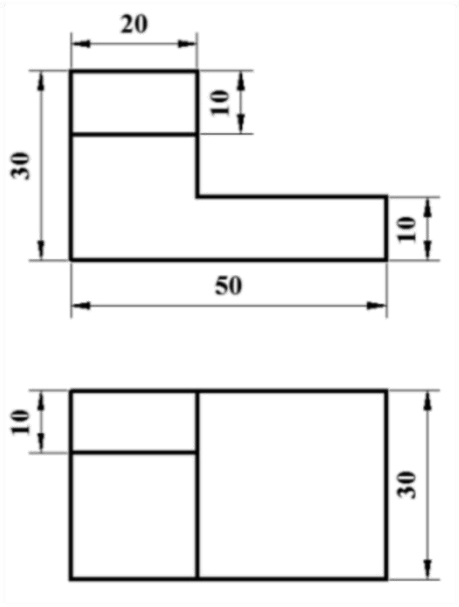


Figure T11.1

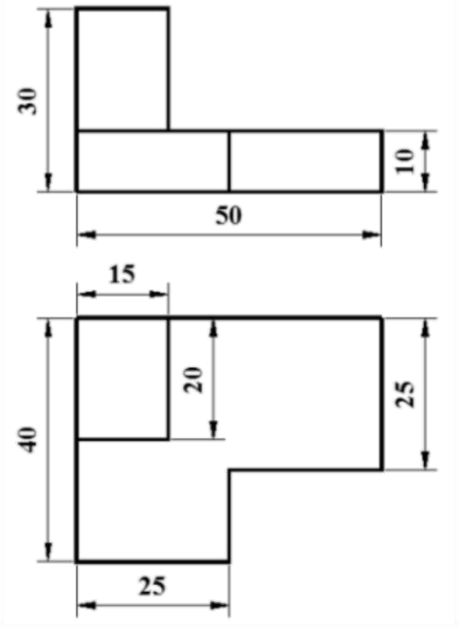


Figure T11.2

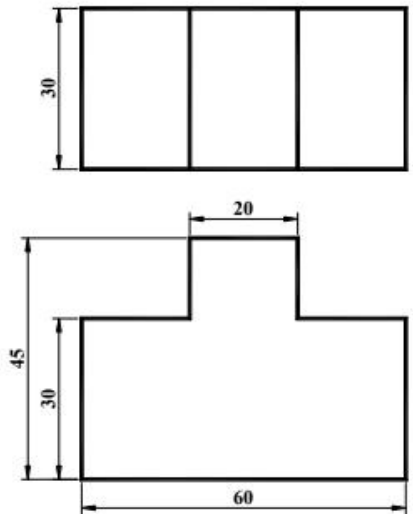


Figure T11.3

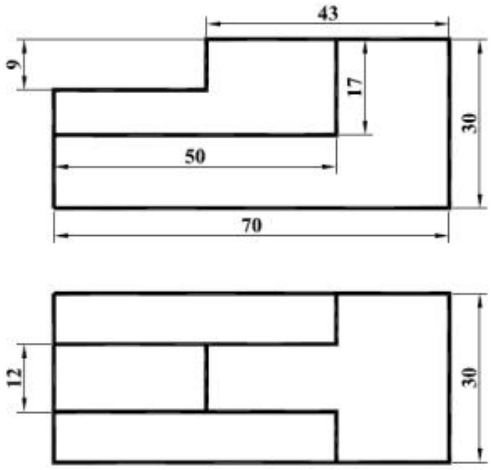


Figure T11.4

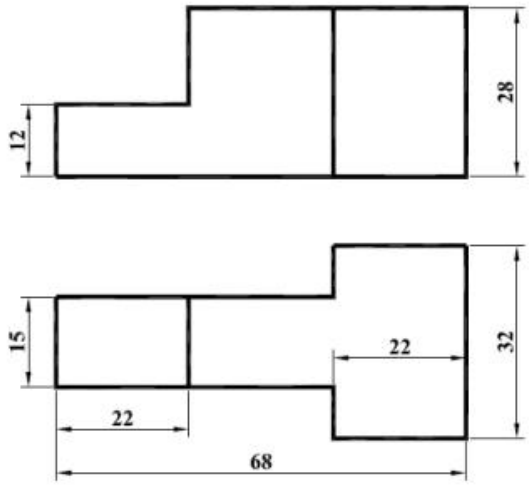


Figure T11.5

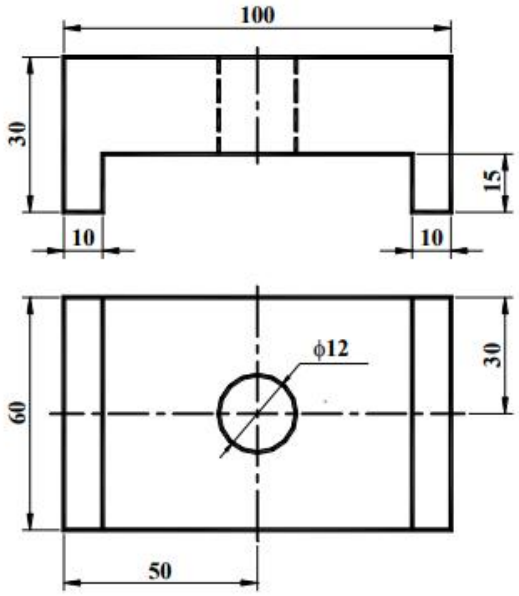


Figure T11.6

Exercise :

1. A cube of side base 30 mm rests with it base on the ground and one of the faces inclined at 45 degree to the picture plane. The nearest vertical edges touches the PP. The station point is 50 mm in front of the PP, 60 mm above the ground an opposite to the nearest vertical edge that touches the PP. Draw the perspective view.

2. Draw the perspective view of a cube of 25 mm edge, resting on ground with one of its faces. It has one of its nearest vertical edges is 10 mm behind the picture plane and all its vertical faces are equally inclined to the picture plane. The station point is 55 mm in front of the picture plane, 40 mm above the ground and lies in the central plane, which is 10 mm right of the center of the cube.

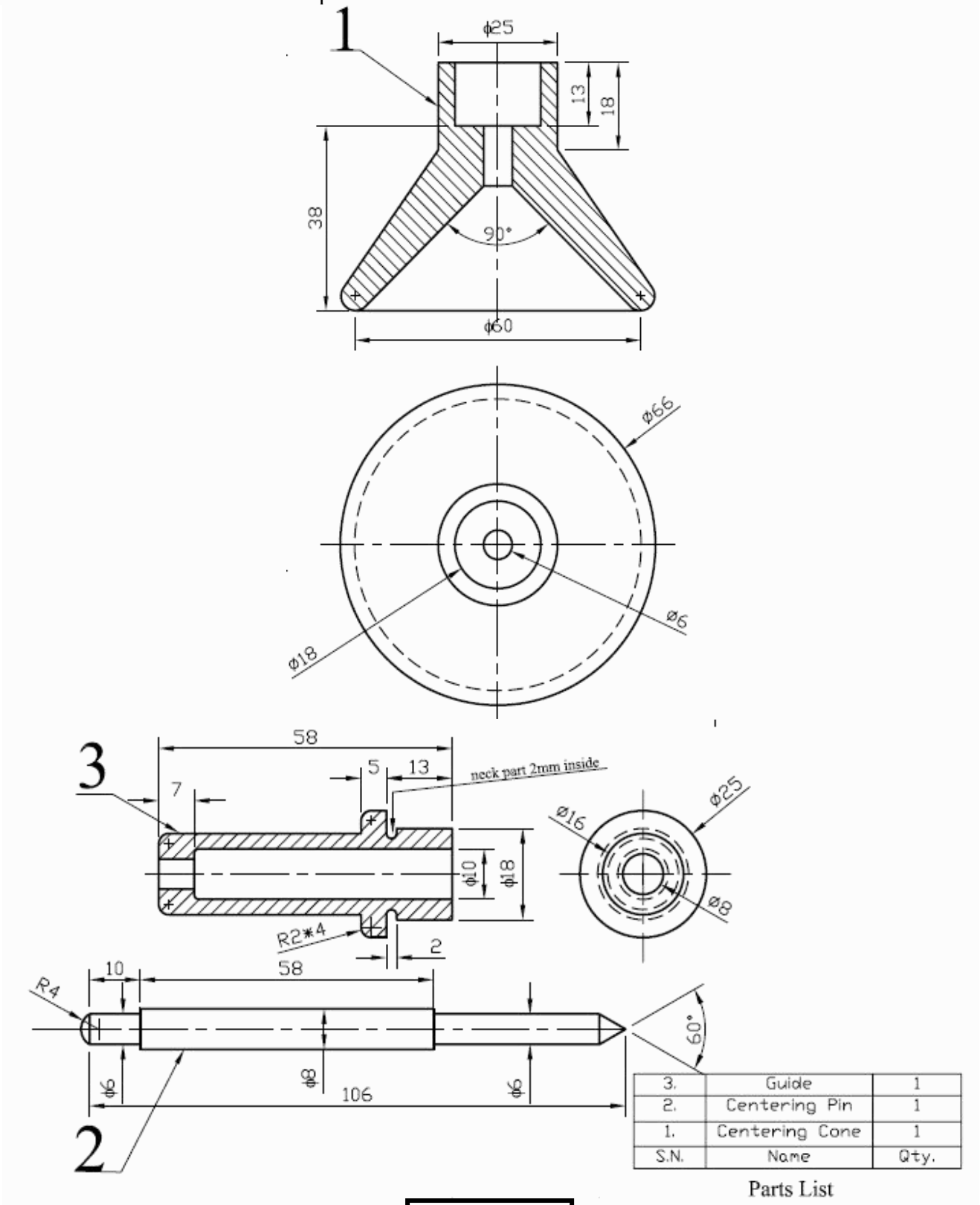
3. A model of steps has 3 steps of 15 mm tread and rise 10 mm. The steps measure 50 mm wide. The vertical edge of bottom steps, which is nearer to the picture plane, is 25 mm behind PP and the width of steps recede to the left at an angle of 30 degree to PP. The station point is 100 mm in front of PP and 60 mm above the ground plane and 30 mm to the right of the vertical edge, which is nearest to PP. Draw the perspective view of the model.

SHEET NO: 12

ASSEMBLY DRAWINGS

(Only for BE Civil and Civil & Rural)

1. Figure below shows the detail drawing of a centering cone. Assemble the parts and draw the sectional front view and the top view.



S.N.	Name	Qty.
3.	Guide	1
2.	Centering Pin	1
1.	Centering Cone	1

Parts List

Figure T12.1

2. Figure below shows the detail drawing of a suspender of suspension bridge. Assemble the parts and draw the front view and the side view.

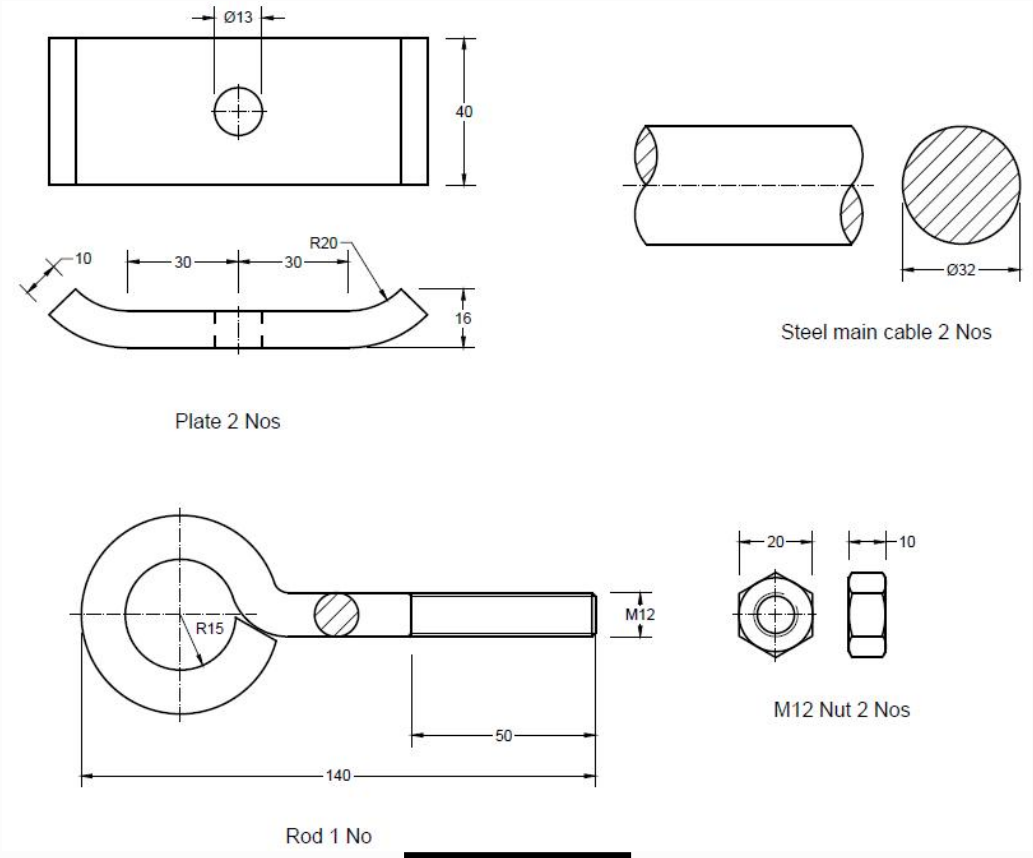
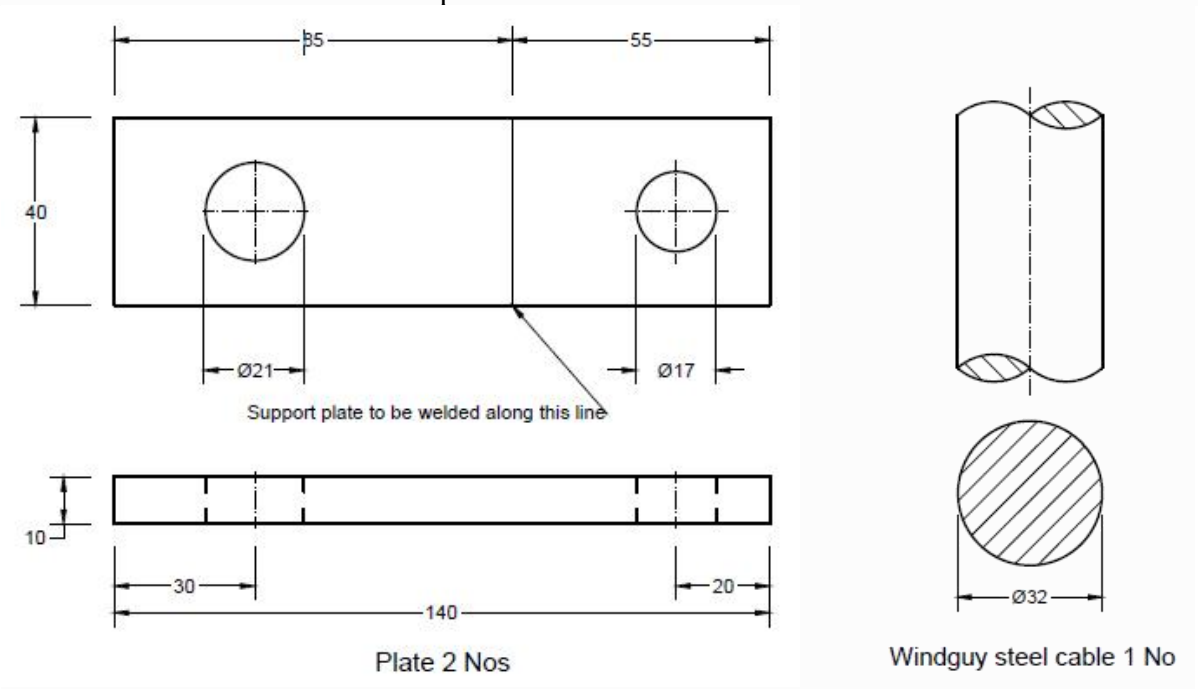


Figure T12.2

3. Figure below shows the detail drawing of a cable clamp of suspension bridge. Assemble the parts and draw the front view and the top view.



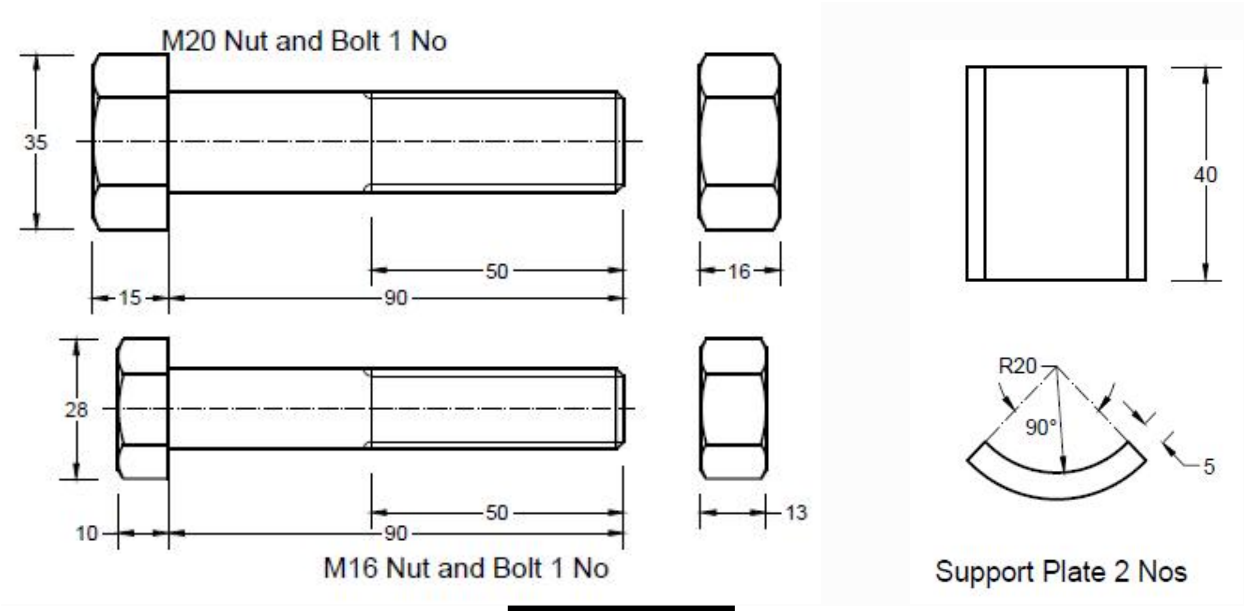


Figure T12.3

4. Figure below shows the detail drawing of a turnbuckle. Assemble the parts and draw the front view and the side view.

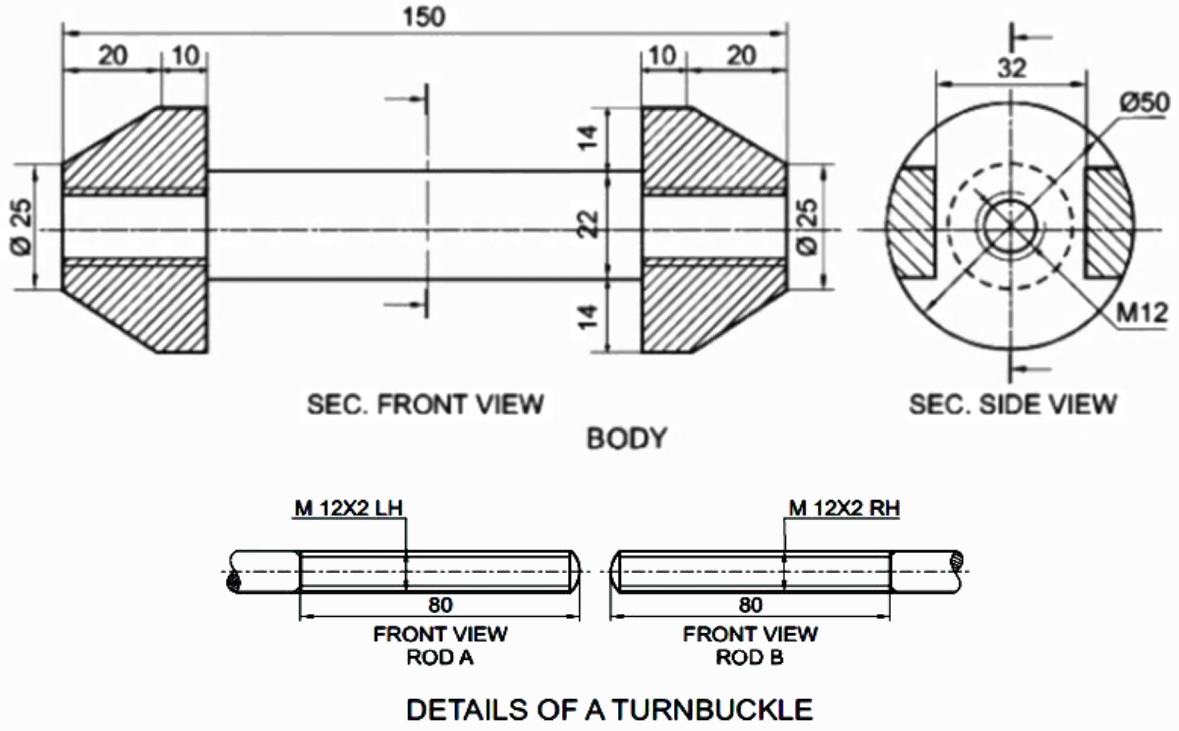
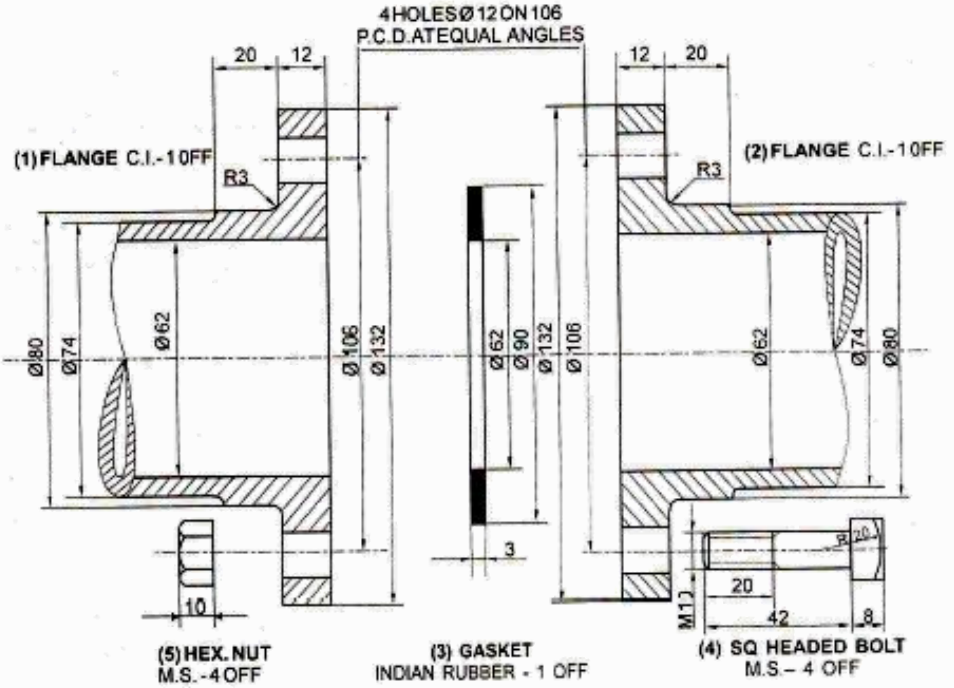


Figure T12.4

5. Figure below shows the detail drawing of a flange pipe joint. Assemble the parts and draw the front view and the side view.



DETAILS OF A FLANGED PIPE JOINT

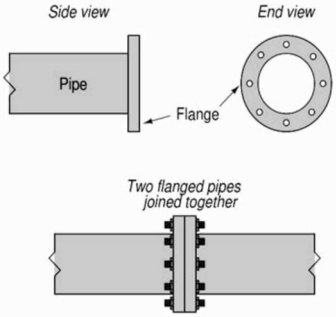
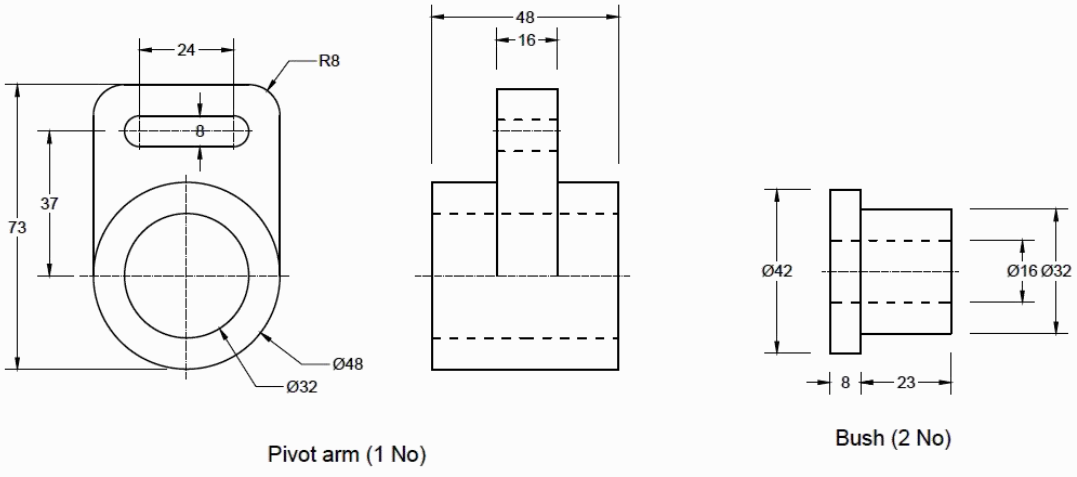
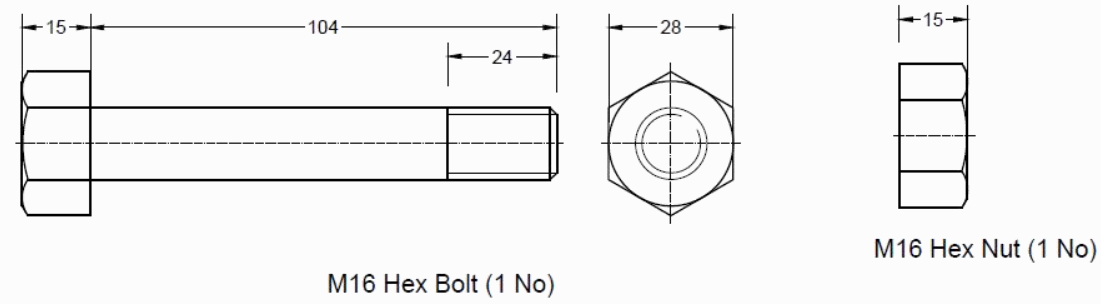


Figure T12.5

6. Figure below shows the detail drawing of an anti-vibration mount. Assemble the parts and draw the sectional front view and the side view.





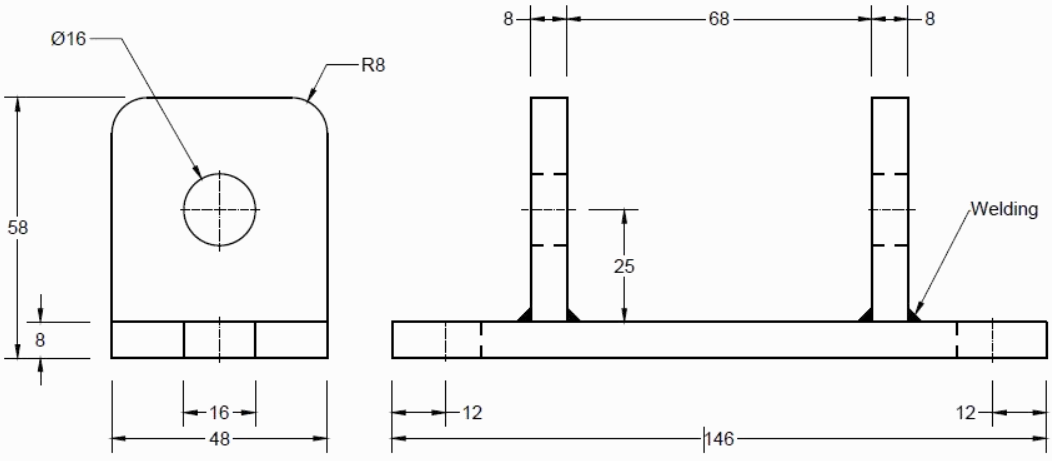
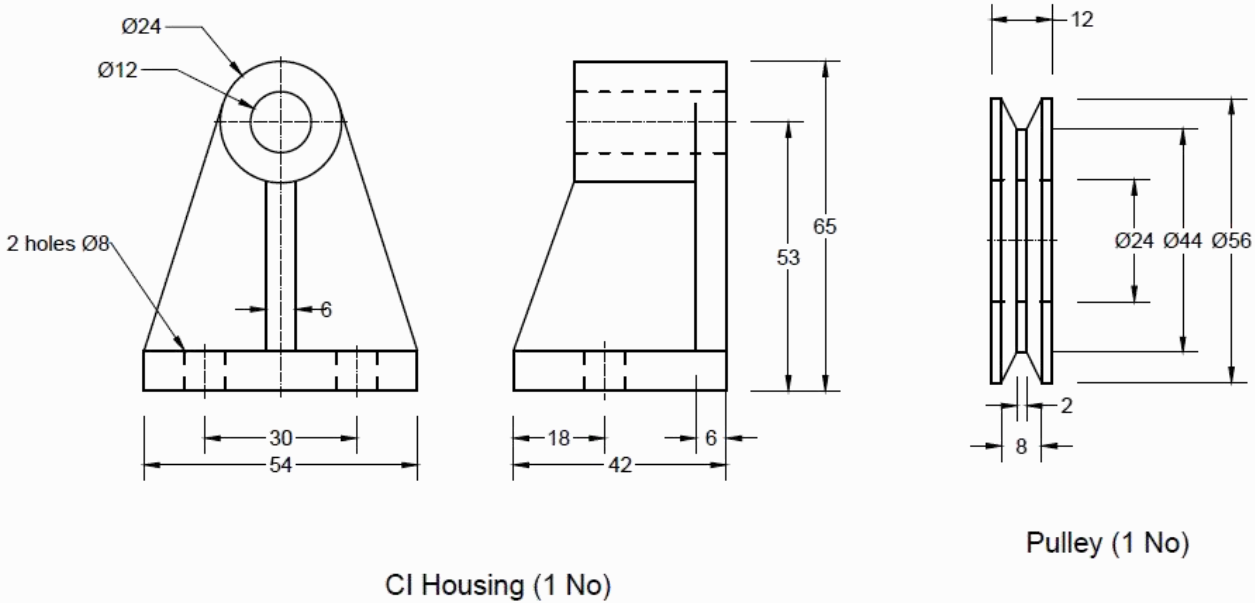


Figure T12.6

7. Figure below shows the detail drawing of a pulley mount. Assemble the parts and draw the sectional front view in section and the side view.



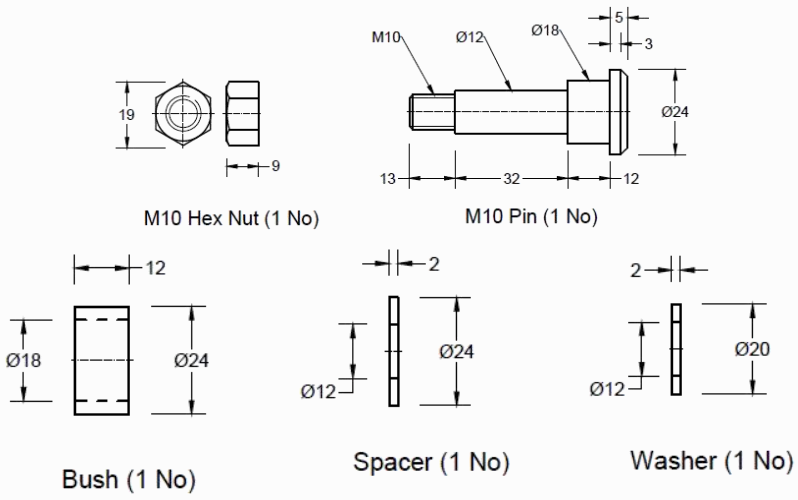


Figure T12.7

8. Figure below shows the detail drawing of a machine component. Assemble the parts and draw the sectional front view in section and the side view.

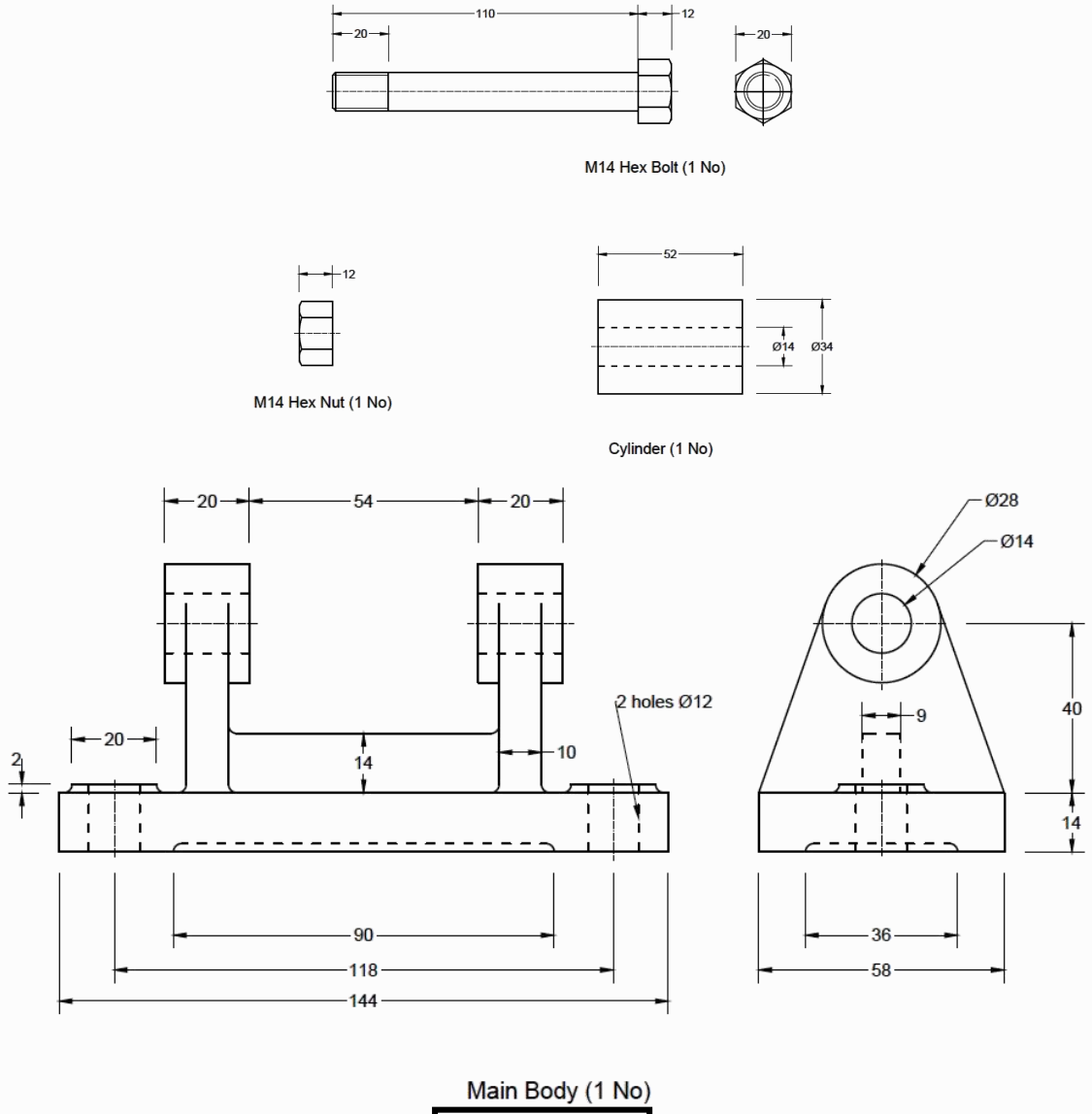
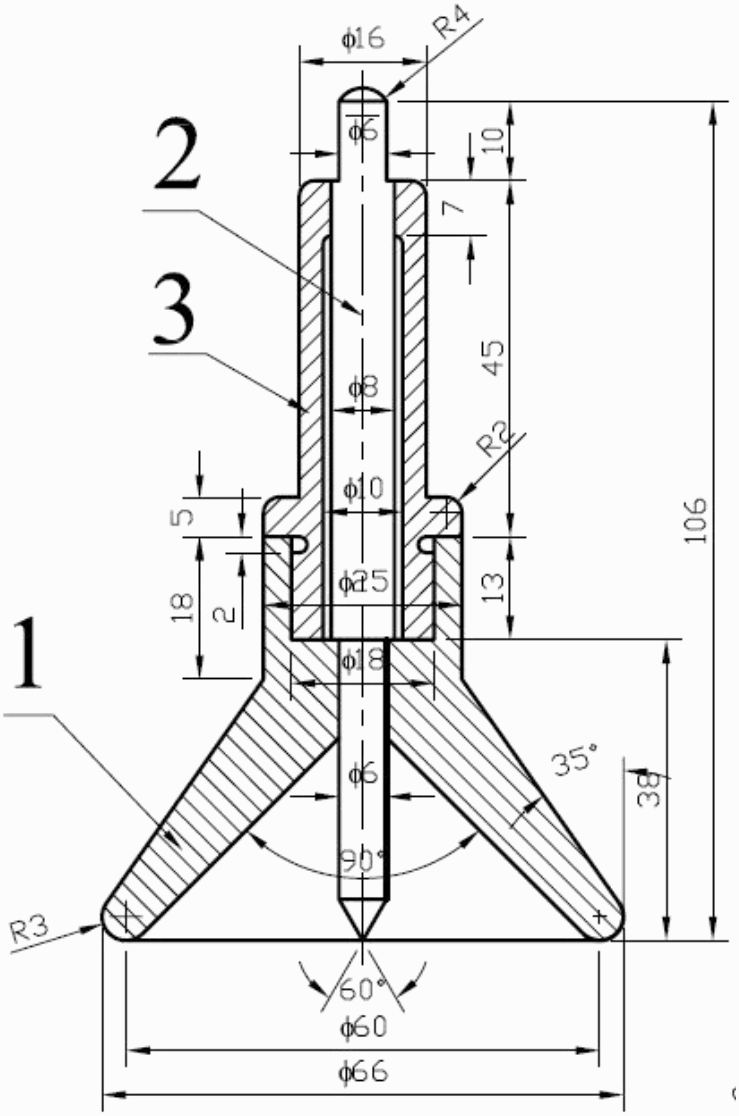
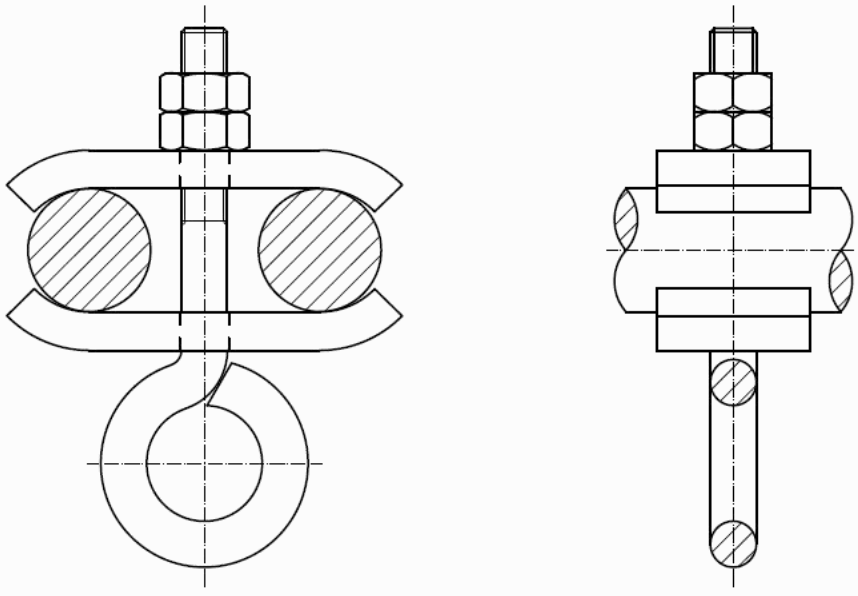


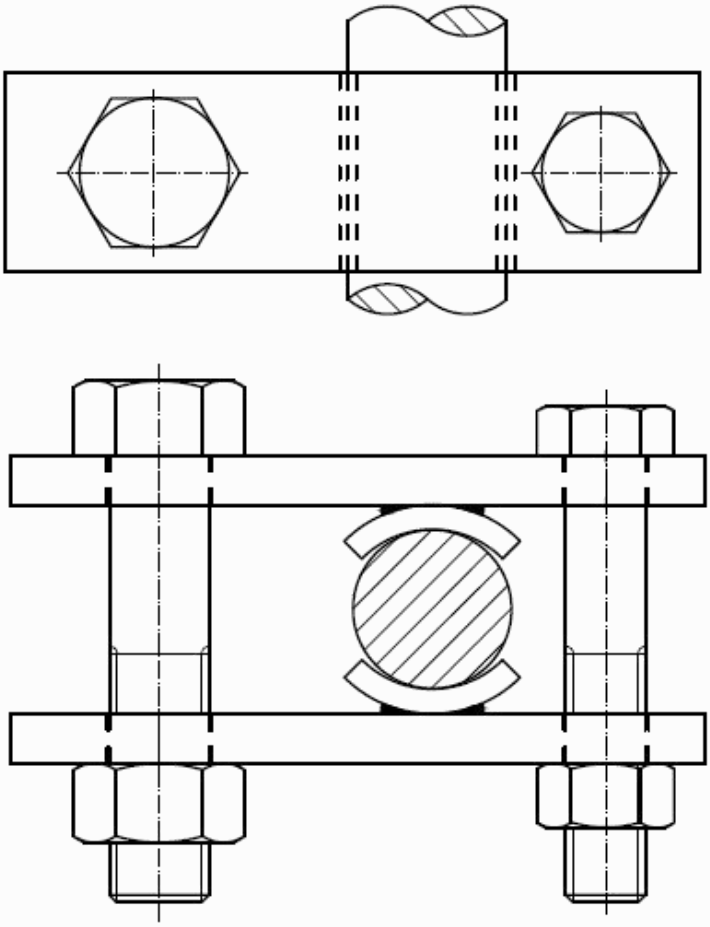
Figure T12.8



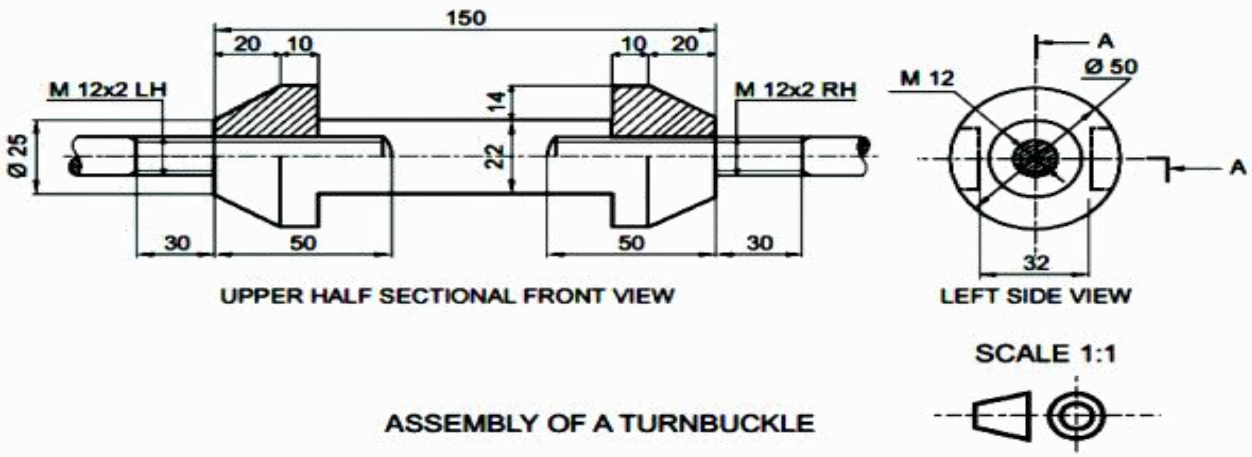
Assembled Drawing of a Centering Cone (only for reference)



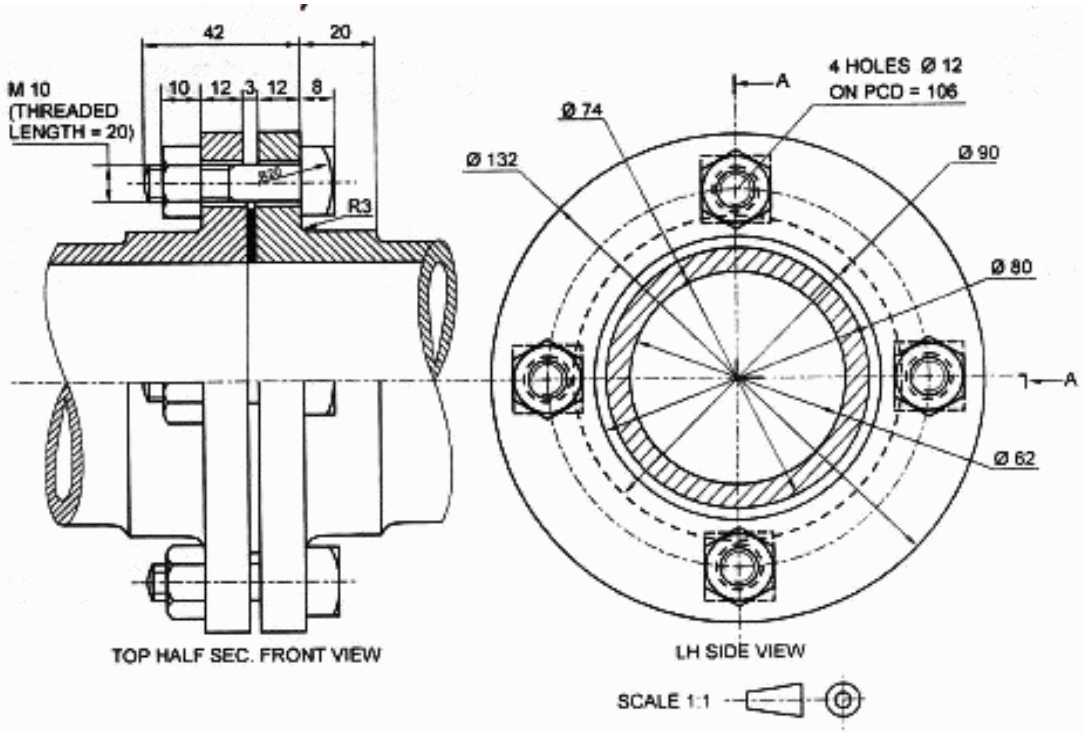
Assembled Drawing of a Suspender of suspension bridge (only for reference)



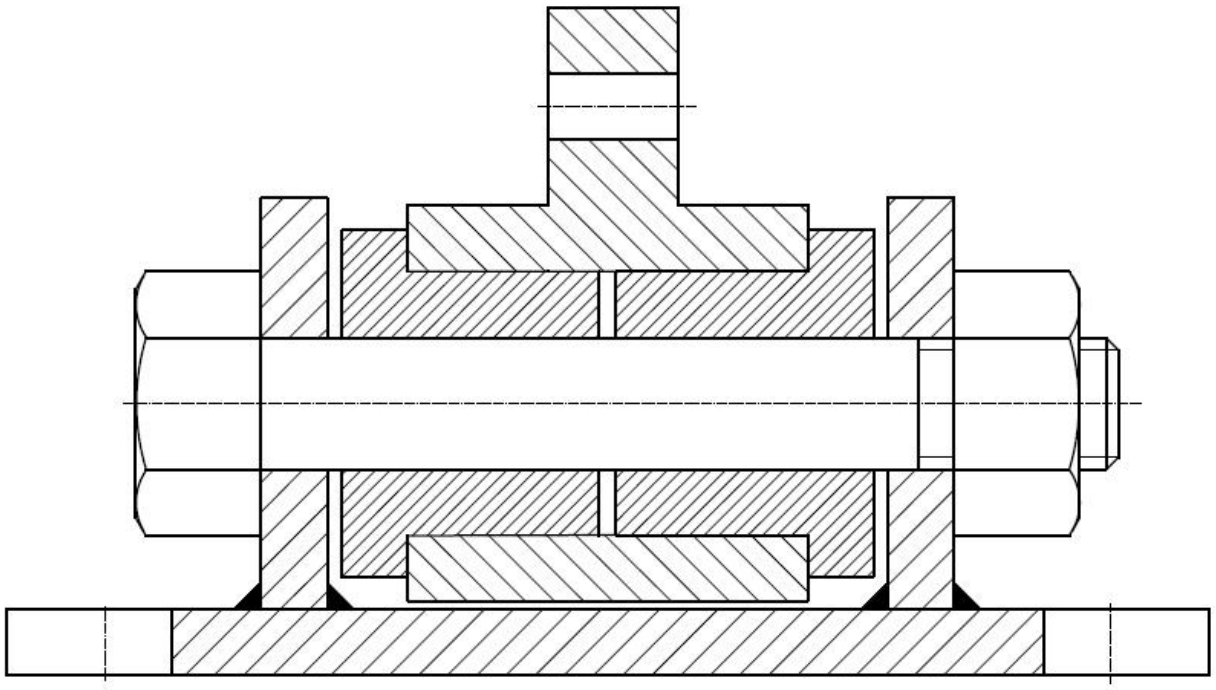
Assembled Drawing of a Cable Clamp of suspension bridge (only for reference)



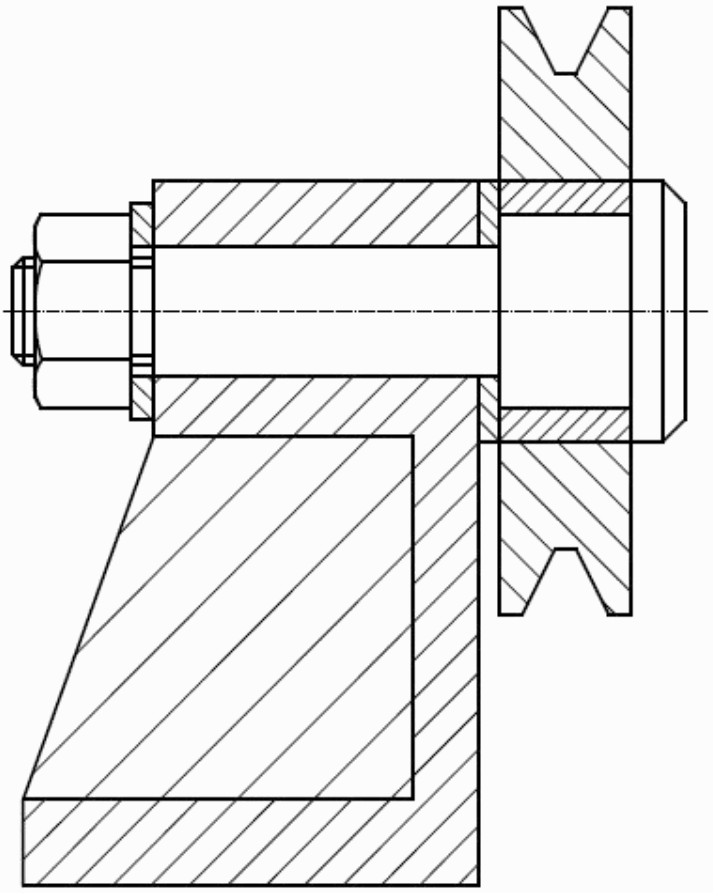
Assembled Drawing of a Turnbuckle (only for reference)



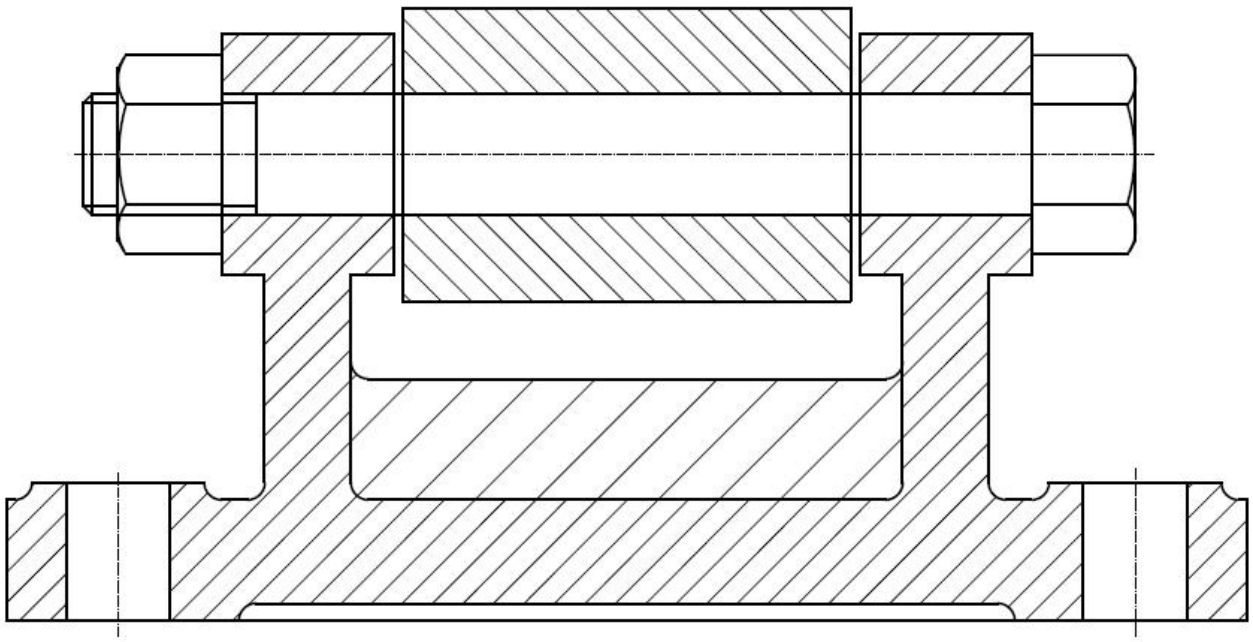
Assembled Drawing of a Flange Pipe joint (only for reference)



Assembled Drawing of an Anti-Vibration Mount (only for reference)



Assembled Drawing of a Pulley Mount (only for reference)



Assembled Drawing of a Machine Component (only for reference)

SHEET NO: 13

GRAPHICAL SYMBOLS

Sketch freehand the graphical symbols for the following welding items.

Lap Weld		Fillet	
Square Butt		Single V-Butt	
Double V-Butt		Single U-Butt	
Double U- Butt		Single J-Butt	
Single Bevel Butt		Double Bevel Butt	
Double J-Butt		Spot Weld	
Bead or Edge Weld		Seam Weld	
Field Weld		Weld all around	
Fillet Weld on own side of joints		Fillet weld on opposite side of joint	
Fillet weld on both sides of joint			

Sketch free hand the graphical symbols for the following Engineering items.

Electronics and Electrical

Amplifier		Antenna		Arrester		Battery	
Circuit Breaker		Capacitor		Coil		Connector	
Electric Contact		Core		Fuse		Directional Coupler	
Ground		Handset		Rectifier		Visual Signaling device	
Receiver		Repeater		Ground		Handset	
Thermocouple		Inductor Winding		Incandescent Lamp		Ballast Lamp	
Transformer		Switch		Resistor		Transmission Path	
Generator		Motor		Solenoid		Thermostat	
Thermistor		Variable Resistor		Voltmeter		NPN-type Transistor	
PNP-type Transistor		Direct Current		Alternating Current		Power Frequency	
Apparatus & Machine suitable for DC or AC		Half-wave Rectifier		Line or Cable existing		Line or Cable planned	
Controlled Rectifier		Power Line		Underground Cable		Overhead Line	

Electronics and Electrical

Conductors or a group of Conductors		Flexible Conductors		Two Conductors		Three Conductors	
Four Conductors		Junction of Conductors		Crossing without Electrical Connection		Crossing and Connecting Conductors	
Frame and Chassis Connection		Fault		Fault to Frame		Earth Fault	
Mechanically Coupled Machine		DC Generator		AC Generator		DC Motor	
AC Motor Single Phase		Three Phase Motor		Three Phase Motor in Delta Connection		One Way Switch (Single Pole Switch)	
Two Pole Switch		Three Pole Switch		Two Way Switch		Intermediate Switch	
Push Button Switch		Socket Outlets		Socket Outlets, 5A		Socket Outlets, 5A with Switch	
Socket Outlets, 15A with Switch		Lamp mounted on ceiling		Group of 3, 40 Watt Lamp		Lamp mounted on wall	
Fluorescent Lamp		Ceiling Fan		Wall mounted Fan		Exhaust Fan	
Fan Regulator		Bell		Pickup		Buzzer	
Siren		Public addressing System		Diode with Filament		Telephone-Telegraph Line	

Structural Items

Plate		Angle		Channel		I-beam	
H-beam Tee		Round Solid Bar		Square Bar		Flat Bar	
Circular Tube		Square Tube		Rectangular Tube		Unequal Angle	
Equal Angle							

Other Engineering – Architecture, Civil, Agriculture, Topographic, etc.

School		Church		House		City or Town	
Cemetery		Building any kind		Temple		Gumba	
Mosque		Unimproved Highway		Improved Highway		Trail	
Single Track		Double Track		Electrical Railroad		Ferry	
Highway Bridge		Railroad Bridge		Ford		Dam	
State Line		Country Line		Township Line		City or Village Line	
Mine Quarry		Oil or Gas wells		Tanks		Embankment	
Cut		Levees		Tunnel		Fence (any kind)	

Rail Fence		Barbed Wire Fence		Smooth Wire Fence		Stone Fence	
Hedge Fence		Contours		Depression Contours		Hill Contours	
Hachures		Bluffs		Sand		Sand Dunes	
Glaciers		Stream		River		Lake	
Rapids		Tidal Swamp		Cypress Swamp		Fresh Water Swamp	
Salt Water Swamp		Trees Deciduous		Trees Coniferous		Willows	
Orchard		Meadow		Cultivated		Corn	
Cotton							

SHEET NO: 14

COMPUTER AIDED DRAWINGS

- Introduction to AutoCAD,
- Basic commands for 2D drawing like: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc.
- Basics of 3D drawings