Q.No.1   A line AB, 80 mm long has its end A 20 mm above H.P. and 15 mm in
front of V.P. Its end B is 50 mm above H.P. aned 70 mm in front of V.P.
Draw the projections of the line and determine its inclinations with H.P.
and V.P. Find its traces also

Ans

Draw X-Y line and print VP and HP as shown for Ist angle of projection. Then follow
the following steps:
- First mark a at a distance of 15mm , and a' at a distance of 20 mm
  respectively, the top view and front view respectively of the end A
- Draw the locus of b and at a distance of 70mm and 50 mm respectively to get
  the top and front views of end B
- With a' as centre and radius equal to 80 mm, cut the locus of b' and project to
  the top view to get b as shown.
- Join a with b, which is the actual **top view** of the line
- Draw projector from b to get b' as shown.
- Join a' with b', which is the actual **front view** of the line
- Measure angle α and β which are the angles of inclination of the line with HP
  and VP respectively.
- Extend the views to get traces as shown.

   See Figure 1

Q.No.2   A hexagonal prism has base side of 25 mm and height 70 mm long. It is
resting on its base on H.P. with one side of base parallel to V.P. It is cut by
a section plane perpendicular to V.P. and inclined at 60° to H.P. and
passing through a point on the extreme left hand longer edge, 50 mm from
the top. Draw its sectional plane, elevation and true shape of the section.

Ans.

Draw the section of solid with the following steps:
- Draw the top and front view of a Hexagonal prism of side 25 mm and height 70
  mm such that one of the edge of the base is parallel to VP as shown in fig.
- Pass a section plane in the front view at an angle of 60° so as to pass through a
  point on the extreme left hand longer edge, 50 mm from the top of the solid
- Mark the section points along the section plane, wherever it cuts the edges or
  corners of the solid
- Transfer these section points to the top view and join them to get the sectional top
  view as shown

- Draw the true shape of the section on a plane parallel to the inclined section plane as shown in fig.

See Figure 2

Q.No. 3 An equilateral triangle lamina of sides 30 mm is resting with one of its corners on H.P. such that the median passing throught the corner on which it lies is inclined at 30° to H.P. and 45° V.P. The two edges passing through the corner on which it rests are equally inclined to H.P. Draw its projections.

Ans.

Draw the projection by adopting Ist angle of projection with the following steps:
- Draw the top view and front view of a equilateral triangular lamina of side 30 mm as shown in the first position
- Rotate the top view of the lamina, such that median of the lamina is inclined at 45° to VP and at 30° to HP as shown in superimposed position . Draw projectors through the lamina to get the corresponding front view

See Figure 3

Q.No.4 Draw the involute of circle of diameter 30 mm.

Ans   See Figure 4

Q.No.5 A pentagonal prism has side of base 25 mm and height 60 mm. It is resting on one of its rectangular faces on H.P. with its axis inclined at 30° to V.P. Draw its projections.

Ans
Draw X-Y line and print VP and HP as shown for Ist angle of projection. Then follow the following steps:

- Draw the top view and front view of a pentagonal prism of base side 25 mm and height 60 mm as shown in the first position when it is lying with one of its rectangular faces on HP.
- Now draw the top view such that the axis is inclined at 30° to VP as shown in second position
- Draw projectors through all the corners of the solid to get corresponding front view as shown in fig.

See Figure 5

Q.No.6.   Details of a knuckle joint are shown in Figure. Draw the front section view of the assembly to a suitable scale.

Ans   See Figure 6

Q.No.7   Details of projected flange coupling are shown in figure above. Draw the sectional front view of the assembly to a suitable scale.

Ans   See Figure 7

Q.No.8   Draw two views of a double riveted bolt joint with double straps, for joining two planes 16 mm thick. The rivet diameter is 24 mm. Assume other dimensions. Write the main dimensions on the drawings.

Ans   See Figure 8

Q.No. 9   Explain with the help of a schematic drawing the following:
Zero line, tolerance, maximum diameter, minimum diameter, lower deviation, upper deviation and tolerance zone.

Ans   See Figure 9

Q.No.10   Sketch two views of a ball bearing having bore of 35 mm, outer diameter 100 mm and width 35 mm.

Ans   See Figure 10

Q.No.11   An electric lamp hanged by an electric wire in the center of a room 4 m x 4.5 m, 6 m high at a distance of 3 m from the ceiling. Determine graphically its distance from one of its corners of the floor.

Ans

Draw projection by adopting Ist angle of projection with the following steps:
- First draw the top view and front view of the room.
- o-l and o'-l' which constitutes the top view and front views of the line connecting the electric lamp with one corner of the room.
- With o' as centre and radius equal to o-l, cut the locus of o at l1 and project to the front view to get l1' as shown.
- Join o' with l1', which is the actual **true length** of the connecting line

See Figure 11

Q.No.12   Two fixed points A and B are 80 mm apart. Trace the complete path of point P moving in same plane as that of A and B in such a way that the sum of its distances form A and B is always equal to 120 mm.

Ans

F1 F2 = 80 mm;   F1C + F2C = 120 mm

See Figure 12

Q.No.13   A pentagonal pyramid of base edge 30 mm, axial height 65 mm has one of its triangle faces in the H.P. with the axis parallel to the V.P. Draw the projections of the solid.

Ans

Draw X-Y line and print VP and HP as shown for Ist angle of projection. Then follow the following steps:

- Draw the top view and front view of a pentagonal pyramid of base side 30 mm and height 65 mm as shown in the first position
- Redraw the front view of the solid, such that one of the triangular surface (ocd) is on HP and axis being parallel to VP as shown in second position .
- Draw projectors through all the corners of the solid to get corresponding top view as shown in fig.

See Figure 13

Q.No.14   A cylinder, 40 mm dia and 60 mm long has its axis parallel to both H.P. and V.P. It is cut by a section plane perpendicular to H.P. and inclined at an angle of 30° to V.P. at a distance 15 mm along the axis from one of its ends. Draw the sectional elevation and true shape of the section.

Ans

Draw the section of solid with the following steps:
- Draw the top and front view of a cylinder of diameter 40 mm and height 60 mm such that axis is parallel to both HP and VP as shown in fig.
- Pass a section plane in the top view at an angle of 30° so as to pass through a point on the axis, 15 mm from one end of the axis.
- Mark the section points along the section plane, wherever it cuts the generators or faces of the solid
- Transfer these section points to thefront view and join them to get the sectional front view as shown

- Draw the true shape of the section on a plane parallel to the inclined section plane as shown in fig.

   See Figure 14

Q.No.15   Figure below shows pictoral view of an object. Draw following views of it to the scale 1:1.
   (i)   Sectional elevation at AA.
   (ii)   Plan.

Ans   See Figure 15

Q.No.16.   Construct a parabola where the distance between the focus and directrix is 30 mm. Draw the tangent and normal at any point on the curve.

Ans   See Figure 16

Q.No.17.   Figure below shows pictorial view of a bushed bearing. Draw the following views to the scale 1:2.
   (i)   Front view left half in section, in the direction of 'A'.
   (ii)   Side view.

Ans   See Figure 17

Q.No.18.   Sketch four methods of preventing the rotation of brasses in a journal bearing.

Ans   See Figure 18

Q.No.19 (a)   Sketch neatly any one of foundation bolts giving important relations. Take nominal bolt diameter as 20 mm.
   (i)   Rag bolt.
   (ii)   Lewis bolt.

Ans   See Figure 19(a)

Q.19. (b)   Sketch neatly two types of locking of nuts. Add imporatant relations. Take nominal bolt diameter as 24 mm.

Ans   See Figure 19(b)

Q.No.20   Draw following views of a square headed bolt with a square nut. Take di̶
of bolt = 24 mm, shank length = 100 mm.
(i)   Elevation.
(ii)   Side view.

Ans   See Figure 20

Q.No.21   A line AB measures 70 mm and has its end A 15 mm in front of V.P. and
20 mm above H.P. and other end B is 60 mm in front of V.P. and 50 mm
above H.P. Draw the projections of the line and find the inclination of the
line with both the reference planes of projection.

Ans

Draw X-Y line and print VP and HP as shown for Ist angle of projection. Then follow
the following steps:
- First mark a at a distance of 15mm , and a' at a distance of 20 mm
respectively, the top view and front view respectively of the end A
- Draw the locus of b and at a distance of 60mm and 50 mm respectively to get
the top and front views of end B
- With a' as centre and radius equal to 70 mm, cut the locus of b' and project to
the top view to get b as shown.
- Join a with b, which is the actual **top view** of the line
- Draw projector from b to get b' as shown.
- Join a' with b', which is the actual **front view** of the line
- Measure angle α and β which are the angles of inclination of the line with HP
and VP respectively.

See Figure 21

Q.No. 22.   An equilateral triangle lamina of 60 mm side lies with one of its edges on
HP such that the surface of lamina is inclined to H.P. at 60°. The edge on
which it rests is inclined to V.P. at 60%. Draw the projections of the
lamina.

Ans

Draw X-Y line and print VP and HP as shown for Ist angle of projection. Then follow
the following steps:
- Draw the top view and front view of a equilateral triangular lamina of side
60 mm as shown in the first position
- Redraw the front view of the lamina, such that one of the edge bc of the
lamina is on HP and the surface of the lamina being inclined at 60° to HP

as shown in superimposed first position . Draw projectors through the lamina to get the corresponding top view
- Now draw the top view such that edge bc is inclined at 60° to VP in the top view as shown in second position
- Draw projectors through all the corners of the lamina to get corresponding front view as shown in fig.

See Figure 22

Q.No.23   A tetrahedron of 60 mm long edges resting on HP on one of its sides, such that the apex lies 25 mm above H.P. Draw its projection. Measure the height of the solid.

Ans

Draw X-Y line and print VP and HP as shown for Ist angle of projection. Then follow the following steps:
- Draw the top view and front view of a tetrahedron of side 60 mm as shown in the first position and measure the height (H) of the solid.
- Redraw the front view of the solid, such that the apex (o') of the solid is 25 mm above HP as shown in second position.
- Draw projectors through all the corners of the solid to get corresponding top view as shown in fig.

See Figure 23

Q.No.24   A cylinder of diameter 60 mm and 80 mm long stands with its circular base on H.P. A section plane perpendicular to V.P. and inclined at 60° to H.P. cuts the axis at a point 28 mm from its top end. Draw the sectional top view, right side view and the true shape of section.

Ans

Draw the section of solid with the following steps:
- Draw the top, front view and right side view of a cylinder of diameter 60 mm and height 80 mm such that it stands with its circular base on HP as shown in fig.
- Pass a section plane in the front view at an angle of 60° so as to pass through a point on the axis, 28 mm from top end of the axis.
- Mark the section points along the section plane, wherever it cuts the generators or faces of the solid
- Transfer these section points to the top view and right side view and join them to get the sectional top view and sectional right side view as shown in fig.
- Draw the true shape of the section as shown in fig.

See Figure 24

Q.No.25   Draw one convolution of an involute of circle of dia 40 mm. Also draw tanget at any point on the curve.

Ans   See Figure 25

Q.No.26   Draw front view of a circle of dia 80 mm and show its isometric views on XY; YZ; ZX planes.

Ans   See Figure 26

Q.No.27 (a)   Draw two views of an hexagonal headed bolt M36 x 100 with a washer and hexagonal nut.

Ans   See Figure 27(a)

Q.No.27 (b)   Explain with the help of a schematic drawing for hole of

$\phi\ 40^{H7}\ \text{mm} \begin{pmatrix} 0.025 \\ 0.000 \end{pmatrix}$ the following:

Basic size, zero line, tolerance, min. dia, max. dia, lower deviation, upper deviation, tolerance zone.

Ans   See Figure 27(b)

Q.No.28   Draw following views of the object shown in the figure
   (i)   Front view.
   (ii)   Side view.
   (iii)   Top view.
   Show all dimensions.

Ans   See Figure 28

Q.No.29   Draw following views of box coupling for shaft of dia 25 mm and show all important relations.
   (i) Front view.   (ii) Side view.

Ans
   Shaft diameter = D = 25 mm

See Figure 29

Q.No. 30

Draw the top and front view of the cut portion of the cylinder. Draw the development of the complete cylinder with length = π D = π x 60 = 188.57 mm and height = 80 mm. Divide the circle in to eight equal divisions as shown in fig. Also divide the development of cylinder in to eight equal parts. Draw the horizontal projectors from cut section of cylinder to get the development of cut portion of cylinder as shown in fig.

Ans   See Figure 30

Q.No.31   Fig below shows the details of an open bearing. Draw the following views of the assembly by taking a scale of 1:2.

           (i)   Front view with left half in section.
           (ii)   Left Side view with right half in section.
           (iii)   Plan.
           Show dimensions. Print title block and draw the projection symbol.

Ans   See Figure 31

Q.No.32   A line AB 65 mm long makes 30° with H.P. and 45° with V.P. End A is in H.P. and end B is in V.P. Draw the projection of the line and show its traces.

Ans

Draw X-Y line and print VP and HP as shown for Ist angle of projection. Then follow the following steps:

- Since end A is in HP, first mark a' on X-Y , and draw a line at an angle of 30^0. Measure 65mm the true length of line AB on it.
- Since end B is in VP, mark locus of B on X-Y , and draw a line at an angle of 45^0. Measure 65mm the true length of line AB on it.
- Draw the locus of b' and a as shown in fig.
- With a' as centre and length 'B' as radius cut the locus of b' to get a'-b', which is the actual **front view** of the line
- With b as centre and length 'A' as radius cut the locus of a to get a-b, which is the actual **top view** of the line

See Figure 32

Q.No.33 Draw the projections of a regular hexagonal lamina of 30 mm side havin one of its sides in H.P. and inclined at 45° with V.P. Its surface makes an angle of 60° with the H.P.

Ans

Draw X-Y line and print VP and HP as shown for Ist angle of projection. Then follow the following steps:
- Draw the top view and front view of a regular hexagonal lamina of side 30 mm as shown in the first position
- Rotate the front view of the lamina, such that one of its side of the lamina is on HP and surface of the lamina is inclined 60° to HP as shown in fig. in superimposed position . Draw projectors through the lamina to get the corresponding top view
- Redraw the top view of the lamina, such that the edge of the lamina on which it rests is inclined at 45° to HP as shown.
- Draw projectors through all the corners of the lamina to get corresponding front view as shown in fig.

See Figure 33

Q.No.34 Draw the projections of a cylinder of 50 mm diameter and 60 mm long lying on H.P. on one of its generators, with its axis inclined at 30° to V.P. and parallel to H.P.

Ans

Draw the section of solid with the following steps:
- Draw the top and front view of a cylinder of diameter 50 mm and height 60 mm such that axis is parallel to both HP and VP and a generator lying on HP as shown in fig.
- Now draw the top view such that the axis is inclined at 30° to VP as shown in second position
- Draw projectors through all the division points of the solid to get corresponding front view as shown in fig.

See Figure 34

Q.No.35 Construct a cycloid generated by a circle of 35 mm diameter. Draw a tangent and normal to the curve at a point 40 mm from the center of the generating circle at the starting point.

Ans **See Figure 35**

Q.No.36   Draw the following rivet heads for a nominal diameter of the rivet as 24 mm. Show dimensions.

     (a) Snap head.   (b) Pan head   (c) 60° flat countersunk head.

Ans   **See Figure 36**