ENGINEERING GRAPHICS - QUESTION BANK

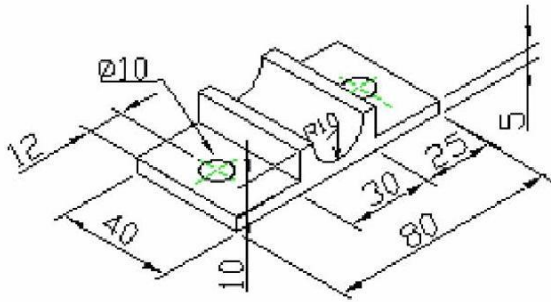## UNIT – I (PLANE CURVES & FREEHAND SKETCHING

a) *ELLIPSE, PARABOLA & HYPERBOLA*

1. Draw the locus of a point P moving so that the ratio of its distance from a fixed point F to its distance from a fixed straight line DD' is ¾ . Also draw tangent and normal to the curve from any point on it.
2. Construct an ellipse given the distance of the focus from the directrix as 60 mm and eccentricity as 2/3. Also draw tangent and normal to the curve at a point on it 20 mm above the major axis.
3. Construct a parabola given the distance of the focus from the directrix as 50 mm. Also draw tangent and normal to the curve from any point on it.
4. Draw the locus of a point P moving so that the ratio of its distance from a fixed point F to its distance from a fixed straight line DD' is 1. Also draw tangent and normal to the curve from any point on it.
5. Draw a hyperbola when the distance between the focus and directrix is 40 mm and the eccentricity is 4/3. Draw a tangent and normal at any point on the hyperbola.
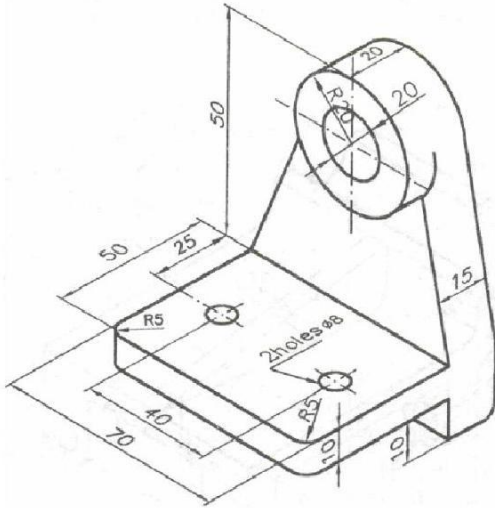
b) *CYCLOIDS & INVOLUTES*

6. Draw the involute of a square of side 30 mm. Also draw tangent and normal to the curve from any point on it.
7. A coir is unwound from a drum of 30mm diameter. Draw the locus of the free end of the coir for unwinding through an angle of 360°. Draw also a tangent and normal at any point on the curve.
8. A circle of 50 mm diameter rolls along a straight line without slipping. Draw the curve traced by a point P on the circumference for one complete revolution. Draw a tangent and normal on it 40 mm from the base line.
9. Draw an epicycloids generated by a rolling circle of diameter 40 mm and the diameter of the directing circle is 140 mm. Also draw tangent and normal to the curve from any point on it.
10. Draw a hypocycloid generated by a rolling circle of diameter 50 mm and the diameter of the directing circle is 240 mm. Also draw tangent and normal to the curve from any point on it.

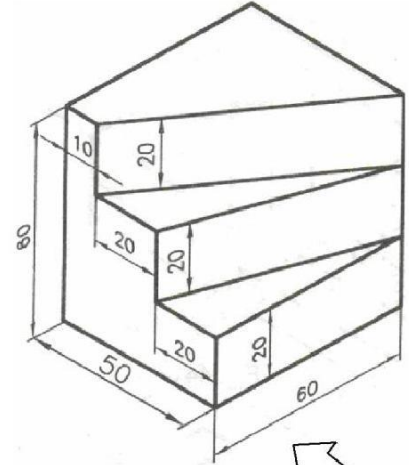## c) FREEHAND SKETCHING (ORTHOGRAPHIC PROJECTIONS FROM PICTORIAL VIEWS)

11. Draw the Orthographic views (Front, Top & Side views) of the given objects shown below. a)
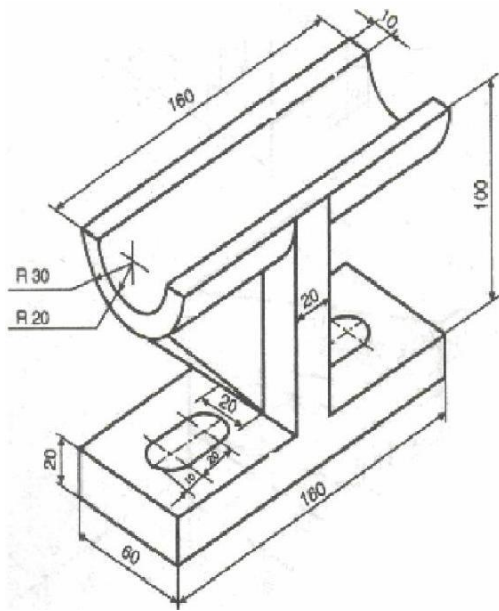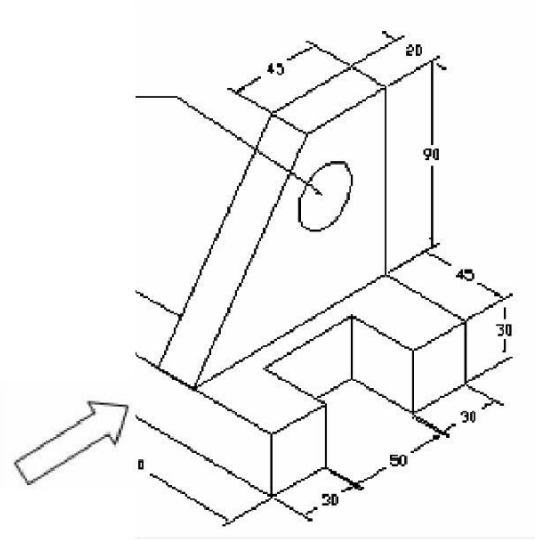
b)

c)

d)

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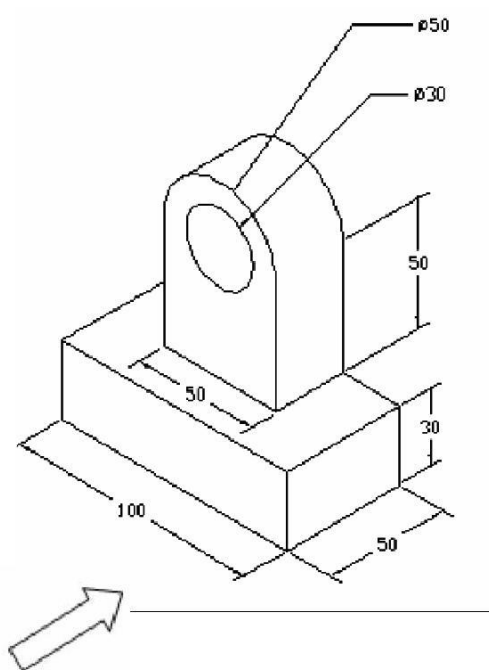
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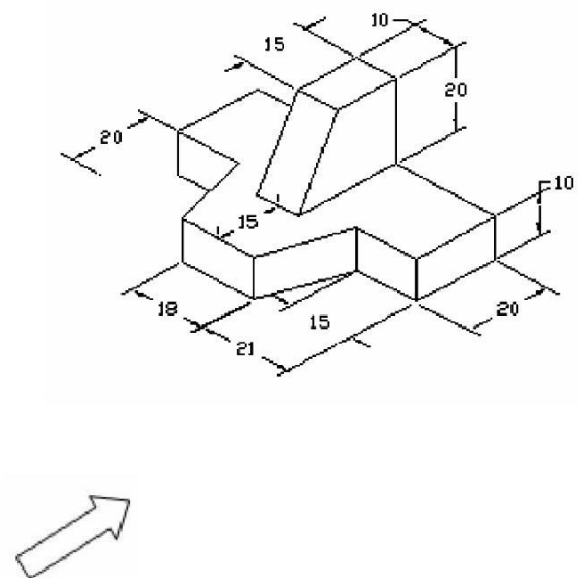⌀30
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g)

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UNIT – II (PROJECTION OF POINTS, LINES & PLANE SURFACES)

a) POINTS

1. Mark the projections of the following points on a common reference line: P, 35 mm behind the VP and 20 mm below the HP.

   Q, 40 mm in front of VP and 30 mm above the HP.

   R, 50 mm behind the VP and 15 mm above the HP.

   S, 40 mm below the HP and in the VP.

2. A point C is on HP and 15 mm behind VP. Another point D is also on HP and 40 mm in front of VP. The distance between their projectors is 45 mm. Join their front views and determine inclination of this line with XY line.

3. A point P is on HP and 20 mm in front of VP. Another point Q is also on HP and behind VP. The distance between their end projectors is 60 mm. Draw its projections if the line joining P & Q makes an angle of 60º with the reference line. Also find the positions of point P and Q.

b) LINES

4. A line PQ, 50 mm long is perpendicular to HP and 15 mm in front of VP. The end P nearer to HP 20 mm above it. Draw the projections of the line.

5. A line PQ, 60 mm long has one end P, 20 mm above the HP and 35 mm in front of VP. The line is parallel to HP. The front view has a length of 50 mm. Find its true inclinations with VP.

6. A line NS, 80 mm long has its end N,10 mm above the HP and 15 mm in front of VP. The other end S is 65 mm above the HP and 50 mm in front of VP. Draw the projections of the line and find its true Inclination with HP and VP.

7. The end P of a line PQ is 30 mm above HP and 35 mm in front of VP. The line is inclined at 35° to HP. Its top view is 70 mm long inclined at 40° to XY. Draw the projections of straight line. Find the true length and inclination of the line with VP.

8. A line MN has its end M, 15 mm in front of VP and 20 mm above the HP. The other end N is 55 mm in front of VP. The front view has a length of 80 mm. The distance between end projectors is 65 mm. Draw the projections of line. Find its true length and true inclinations

9. The mid point of a line AB, 80 mm long, is 30 mm above HP and 45 mm in front of VP. The line is inclined at 30º to HP and 50º to VP. Draw the projections.

10. A straight line ST has its end S, 10 mm in front of VP and nearer to it. The mid point 'm' of the line is 50 mm in front of VP and 40 mm above HP. The front and top views measure 90 mm and 120 mm respectively. Draw the projections of the line. Also, find the true inclinations with VP and the HP.

11. A line MN has its end M, 10 mm in front of VP and 15 mm above HP. The other end N is 50 mm in front of VP. The front view has a length of 70 mm. The distance between the end projectors is 60 mm. Draw the projections of the line. Find its true length, true inclinations and mark the traces.

c) PLANE SURFACES

12. A regular hexagonal lamina of side 30 mm rests on one of its edges on HP. The lamina makes 60°with HP and the edge on which it is resting makes an angle of 60° with VP. Draw its projections.

13. A pentagon of side 30mm rests on HP on one of its corners with the sides containing that corner being equally inclined to HP. The side opposite to the corner on which it rests is inclined at 30˚ to VP and the surface makes 45˚ with ground. Draw the projections of the lamina.

14. Draw the projections of a square plane of side 35mm rests on the ground on one of its corners with a diagonal containing that corner is inclined 40˚ to HP and 50˚ to VP.

15. A regular pentagonal lamina of side 30mm has one edge in HP and inclined at an angle of 30˚ to VP. Draw its projections when its surface is inclined at 45˚ to HP.

16. A rectangular plane of size 40mm x 20mm has its shorter edge on HP and inclined at an angle of 40˚ to VP. Draw the projections when the top view is a perfect square of size 20mm.

17. A regular hexagon of side 40mm is resting on one of its corners on HP and the surface inclined 45º to HP. Draw the projections when the diagonal through the corner resting on HP makes an angle of 60ºwith VP.

18. A hexagonal lamina of side 30mm is resting on one of its sides on VP and inclined at 40˚ to HP. Its surface is inclined at 35˚ to VP. Draw the projections of the lamina.

19. A circular plate of diameter 70 mm has the end P of the diameter PQ in the HP and the plate is inclined at 40° to HP. Draw its projections when the diameter PQ appears to be inclined at 45° to VP in the top view.

20. A hexagonal plate of side 20 mm rests on the HP on one of its sides inclined at 45° to VP. The surface of the plate makes an angle of 30° with the HP. Draw the front view and top view of the plate.

UNIT – III (PROJECTION OF SOLIDS)

Solve by change of position method:

1. A cube of side 40 mm rests on the HP on one of its ends with a vertical face inclined at 40° to VP. Draw its projections (top view, front view and side view).

2. A pentagonal prism of base side 30 mm and axis length 55mm is lying on the ground on one of its rectangular faces. Draw its top view, front and left side view when its axis is perpendicular to VP and the end nearer to the VP is 15 mm away from it.

3. A hexagonal prism of base side 30 mm and axis length 60 mm rests on the HP on one of its base edges with its axis inclined at 60° to HP and parallel to the VP. Draw its top and front views.

4. A cylinder of diameter 30 mm and axis length 50 mm is resting on the HP on a point so that its axis is inclined at 45° to HP and parallel to VP. Draw its top and front views.

5. A hexagonal prism, side of base 20mm and axis 60mm long lies on one of its longer edges on HP and its axis is parallel to both HP and VP. Draw its projections.

6. Draw the projection of a cone of diameter 40mm and height 70mm lying on the ground on one of its base points with a generator perpendicular to HP.

8. A square pyramid of base side 35mm and axis length 65mm is resting on HP on one of its triangular faces with its axis parallel to VP. Draw its projections.

9. A right pentagonal pyramid of side 20 mm and altitude 50 mm rests on one of its edges of the base in the HP. The base being tilted up such that the apex is 30 mm above HP. Draw the projection of the pyramid when the edge on which it is resting is perpendicular to VP.

Solve by change of Reference line method

10. A pentagonal prism of base side 30mm, axis height 60mm is lying on the ground on one of its base edges such that the axis is parallel to VP and inclined at 40º to HP. Draw the projections.

11. A hexagonal prism, side of base 30mm and axis 60mm long, rests with one of its base corner on HP, such that its base makes an angle of 60˚ with HP and its axis parallel to VP. Draw its projections.

12. A hexagonal pyramid side of base 25mm and axis 50mm long rests with one of its base edges on HP and its axis is inclined at 30˚ to HP and parallel to VP. Draw its projections.

13. A pentagonal pyramid of base edge 25mm and axis height 50mm long rests with one of its base corners on HP and its axis is inclined at 40˚ to HP and parallel to VP. Draw its projections.

14. A cylinder of base diameter 50mm and axis height 65mm is resting on HP on a point on the circumference of the base with its axis inclined at 50º to HP and parallel to VP. Draw its projections.

15. Draw the projections of a cone of base diameter 40mm and axis height 50mm long resting on HP on a point of its base circle with its base makes an angle of 35˚ with HP

and parallel to VP.

16. A hexagonal pyramid of side 25mm, axis 75 mm long lies with one of its triangular faces on the HP and its axis parallel to VP. Draw its projections.

UNIT – IV (SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES))

SECTION OF SOLIDS

1. A cube of side 30 mm 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° to HP meeting the axis at 25 mm above the base. Draw its front view, sectional top view and true shape of the section.

2. A pentagonal prism of base side 40mm and height 85mm rests on the H.P such that two of its base edges are equally inclined to VP. It is cut by a plane perpendicular to the V.P and inclined 45° to the H.P. The cutting plane meets the axis at 30mm from the top. Draw the front view, sectional top view and true shape of the section.

3. A hexagonal prism of side of base 20 mm and length 60 mm rests on HP with its axis being vertical and one edge of its base inclined at 15° to VP. The solid is cut by a plane perpendicular to VP and inclined at 40° to HP and bisecting the axis of the prism. Draw the projections of the prism and true shape of thesection.

4. A cylinder of diameter 50mm and height 60mm rests on its base on H.P. It is cut by a plane perpendicular to V.P. and inclined at 45° to H.P. The cutting plane meets the axis at a distance of 15mm from the top. Draw the sectional plan and true shape of the section.

5. A right circular cone of base diameter 50mm and axis length 60mm rests on its base on the H.P. It is cut by a plane perpendicular to the H.P and inclined at 60° to the VP. The shortest distance between the cutting plane and the top view of the axis is 8mm. Draw the top view, sectional front view and the true shape of the section.

6. A pentagonal pyramid of base side 20mm and altitude 55mm rests on its base on HP with one base edge being perpendicular to VP. It is cut by plane inclined at 50^0 to base. The cutting plane meets the axis at 15mm above the base. Draw the front view, sectional top view and true shape of the section

7. A hexagonal pyramid of base side 25mm and axis 55 mm rests on its base on the HP with two base edges perpendicular to VP. It is cut by a plane perpendicular to

VP and inclined at 30° to HP, meeting the axis at 20mm from the vertex. Draw its front view, sectional top view and true shape of the section.

8. 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° to the HP meeting the axis at 21mm above the HP .Draw the sectional top view and the true shape of the section.

9. 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 inclined at 40° to the HP. The cutting plane meets the axis at 30mm from the vertex .Draw the sectional top view.

10. 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 top view and the true shape of the section

DEVELOPMENT OF SURFACES

1. A pentagonal prism of base side 30 mm and axis height 75 mm is resting on its base on HP with two of its lateral surfaces parallel to VP. It is cut by plane perpendicular to VP and inclined at 45° to HP, bisecting the axis. Draw the development of lateral surfaces of the lower portion of the prism.

2. A hexagonal prism of base side 30 mm and axis height 70 mm is resting on its base on HP with one of its faces parallel to VP. It is cut by plane perpendicular to VP and inclined at 35° to HP, meeting the axis at a distance of 40 mm from the base. Draw the development of lateral surfaces of the lower portion of the prism

3. A pentagonal prism of base side 30 mm and height 60 mm is cut by a plane perpendicular to VP and 50° to HP and passing through the axis at a height of 35 mm above the base. Draw the development of the lower portion of the solid.

4. A hexagonal prism of side of base is 25 mm and height 55mm rests with its base on HP and one of its rectangular faces is parallel to VP. A circular hole of 40 mm diameter is drilled through the prism such that the axis of the hole bisects the axis of the prism at right angles and is perpendicular to VP. Draw the development of the lateral surface of the prism with the hole.

5. A cylinder of diameter 45 mm and height 70 mm is resting vertically on one of its ends on the HP. It is cut by a plane perpendicular to VP and inclined at 45° to HP. The plane meets the axis at a point 35 mm above the base. Draw the development of the lateral surface of the lower portion of the truncated cylinder.

6. A vertical chimney of 60 m diameter joins a roof sloping at an angle of 35° with the horizontal. The shortest portion over the roof is 25 m. Determine the shape of the sheet metal from which the chimney can be fabricated. Take a scale of 1:20.

7. A right circular cone of base diameter 50 mm and height 75 mm is resting on its base on the ground. It is cut by a plane perpendicular to VP and inclined at 30⁰ to HP. The cutting plane bisects the axis of the cone. Draw the development of the lateral surface of the truncated cone.

8. A cone of base diameter 50 mm and height 75 mm rests vertically on its base on the ground. A string is wound around the curved surface of the cone starting from the left extreme point on the base and ending at the same point. Find the shortest length of the string required. Also trace the path of the string in front and top views.

9. A hexagonal pyramid of base side 30 mm and height 65 mm rests on its base on the ground with a base edge parallel to VP. It is cut by a plane perpendicular to VP and inclined at 55⁰ to HP and meets the axis at a height of 30 mm from the base. Draw the lateral surface development.

10. A square pyramid of base side 25 mm and altitude 50 mm rests on its base on the HP with two side of the base parallel to VP. It is cut by a plane bisecting the axis and inclined at 30⁰ to the base. Draw the development of the lower part of the pyramid.

11. A pentagonal pyramid of base side 30 mm and height 70 mm is resting vertically on its base on the ground with one of its base edge parallel to VP. It is cut by a plane perpendicular to VP and parallel to HP at a distance of 35 mm above the base. Draw the development of the lateral surfaces of the frustum of pyramid. Also show the sectional plan view.

12. A pentagonal prism of base side 25mm and height 60mm stands on one of its ends on the HP with a rectangular face parallel to the VP.A hole of diameter 30mm is drilled centrally through the prism in such a way that the axis of the hole bisects the axis of the prism at right angles. The axis of the hole is perpendicular to the VP. Draw the development of the lateral surfaces of the prism.

13. A circular hole of diameter 30mm is drilled through a vertical cylinder of diameter 50mm and height 65mm .The axis of the hole is perpendicular to the VP and meets the axis of the cylinder at right angles at a height of 30mm above the base. Draw the development of the lateral surface of the cylinder.

UNIT – V   ISOMERTIC AND PERSPECTIVE PROJECTION

ISOMERTIC PROJECTION

1. A cylinder of height 65 mm and diameter 40 mm is resting on its base on the HP. It is cut by a plane perpendicular to VP and inclined at 30º to the HP. The plane passes through a point on the axis located at 25 mm from the top. Draw the isometric projection of the cut cylinder.
2. A frustum of a square pyramid of bottom edge 50 mm, top edge 25 mm and height 50 mm. Draw the isometric projection of the frustum.
3. A hexagonal pyramid of base 25 mm and height 60 mm stands with its base on the HP with an edge of base parallel to VP. A horizontal plane cuts the pyramid and passes through a point on the axis at a distance of 30 mm from the apex. Draw the isometric projection of the frustum of the pyramid.
4. A pentagonal pyramid of base side 30 mm and height 65 mm stands with its base on HP with a side of base perpendicular to VP. It is cut by a plane inclined at 30º to HP and perpendicular to VP and passes through a point at a distance of 30 mm from the apex. Draw the isometric view of the bottom portion of the pyramid.
5. Draw the isometric projection of a hexagonal prism of base side 25 mm and height 50 mm when it rests on one of its ends on HP with two its base sides parallel to VP.
6. A cone of 50 mm diameter and height 70 mm stands on HP with its base. It is cut by a cutting plane perpendicular to VP and inclined at 30º to HP, cutting the axis of the cone at a height of 40 mm from the base. Draw the isometric view of the remaining part of the cone.

PERSPECTIVE PROJECTION

1. A cube of side 40mm is resting on the ground on one of its faces, with a vertical face in PP and the rest behind it. The central plane is located 50mm to the left of the axis of the cube. This station point is 40mm in front of PP and 60mm above GP. Draw the perspective view of the solid.
2. A square pyramid of side of base 50mm and altitude 70mm stands on the ground vertically with an edge of base parallel to and 20mm behind PP. The station point is 40mm in front of PP and 70mm above the ground. The central plane is located 45mm to the left of the axis of the solid. Draw the perspective view of the solid.
3. A Pentagonal pyramid of 30mm base side and axis height 40mm is standing on its base on the ground Plane with a base side parallel to and 25mm behind PP. The central plane is 35mm to the left of the apex and the station point is 40mm in front of PP and 20mm above the GP. Draw the perspective view of the solid.

4. A cylinder of diameter 40mm and height 65mm rests with its base on the GP such that the axis is 25mm behind the PP. The station point is 30mm in front of the PP and 110mm above the GP and lies in a central plane which is 65mm to the right of the axes of the solids. Draw the perspective view of the cylinder.

5. Draw the perspective projection of a square prism of base side 40 mm and height 50 mm. One of the vertical lateral faces is parallel to PP and 30 mm behind it. The station point is 80 mm from the PP and 80 mm above the ground and 60 mm to the right of the axis of the prism. (Use visual ray method.