

GE8152 ENGINEERING GRAPHICS

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 5+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6 + 12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

OUTCOMES:

On successful completion of this course, the student will be able to

- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of objects.
- project orthographic projections of lines and plane surfaces.

- draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

REFERENCES:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

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INTRODUCTION
GEOMETRICAL CONSTRUCTIONS

Chart number 1

1. Draw an equilateral triangle of side 30mm.
2. Construct a square of side 40mm.
3. Construct a pentagon of side 30mm.
4. Construct a hexagon of side 40mm.
5. Bisect a given line of length 65mm.
6. Bisect a given angle of 45° .
7. Divide a straight line of length 75mm in to 6 equal parts.

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UNIT II

PROJECTION OF POINTS

1. Draw the projections of the following points on a common reference line.

Take distance between projectors as 15mm.

A, 20mm above HP and 25mm in front of VP,

B, 25mm above HP and 30mm behind VP.

C, 35mm below HP and 25mm in front of VP,

D, 40mm below HP and 40mm behind VP,

E is in both HP and VP.

F, 15mm above HP and 30mm in front of VP.

2. Draw the projections of the following points on a common reference line.

Take distance between projectors as 20mm

F, 20mm in HP and 25mm in front of VP,

G, 30mm above HP and in VP,

H, 40mm above HP and 20mm behind VP,

I is in both HP and VP,

J, 40mm in front of VP and in the HP,

K, 25mm below HP and 30mm behind VP,

L, 30mm above HP and 30mm in front of VP.

Assignment questions

Chart number 2

1. Draw projections when distance between projectors is 25mm.

P, 20mm above HP and 25mm behind VP,

Q, 30mm below HP and 50mm in front of VP,

R, is in both HP and VP,

S, 30mm below HP and 25mm behind VP,

T, 30mm above HP and is in VP,

U, 15mm in front of VP and is in HP,

V, 25mm below HP and is in VP,

W, 20mm behind VP and is in the HP.

PROJECTION OF STRAIGHT LINES

1. One end P of a line PQ, 55mm long is 35mm in front of VP and 25mm above HP. The line is inclined at 40° to the HP and 30° to the VP. Draw the projections. (K.V. Natarajan 139).
2. One end S of a line SR, 70mm long is in both HP and VP. The line is inclined at 40° to the HP and 35° to the VP. Draw projections. (K.V. Natarajan 140).
3. A line, NS 80mm long has its end N, 10mm above the HP and 15mm in front of the VP. The other end S is 65mm above HP and 50mm in front of the VP. Draw the projections of the line and find its true inclinations with the HP and VP. (K.V. Natarajan 141).
4. A line PF, 65mm long has its end P, 15mm above the HP and 15mm in front of the VP. It is inclined at 55° to the HP and 35° to the VP. Draw the projections. (K.V. Natarajan 142).
5. The end P of a line PQ, 70mm long is 15mm above the HP and 20mm in front of the VP. Q is 40mm above the HP. The top view of the line is inclined at 45° to the VP. Draw the projections of the line and find its true inclination with the VP and the HP. (K.V. Natarajan 143).
6. A line AB, 70 mm long has its end A, 35mm above the HP and 30mm in front of the VP. The top and front views of the line have lengths of 45mm and 60mm respectively. Draw the projections of the line and find its true inclinations with the HP and VP. (Jeyapoovan 121)
7. A line AB has its end A 20mm above HP and 25mm in front of VP. The other end B is 45mm above HP and 55mm in front of VP. The distance between the end projectors is 60mm. Draw its projections. Also find the true length and true inclination with HP and VP. (Jeyapoovan 131).
8. A line EF 75mm long is in the first quadrant with the end E in the HP and F is in the VP. The line is inclined at 30° to the HP and 45° to the VP. Draw the projections of the line EF (K.V. Natarajan 161).
9. The front view and top view of an 80mm long line PQ measure 70mm and 60mm respectively. The end P is in HP and Q is in VP. Draw projections. (Basant Agarwal 9.32)
10. The midpoint of a straight line AB 90mm long is 60mm above HP and 50mm in front of VP. It is inclined at 30° to HP and 45° to VP. Draw its projections. (Jeyapoovan 137)
11. A line AB measuring 75mm long has one of its ends 50mm in front of VP and 15mm above HP. The top view of the line is 50mm long. Draw and measure front view. The other end is 15mm in front of VP and is above HP. Determine true inclinations. (Jeyapoovan 134).
12. A straight line AB, 86mm long is inclined 30° to HP and 45° to the VP. Its midpoint is 62mm above HP and 52mm in front of the VP. Draw the projections. (K.V. Natarajan 166).

Assignment problems

Chart number 3:

1. A 80 mm long line PQ is inclined at 45° to the HP and 30° to the VP. The end P is HP and 40 mm in front of VP. Draw its projections.
2. A 70 mm long straight line PQ has its end P at 20 mm above the HP and 40 mm in front of the VP. The other end Q is 60 mm above the HP and 10 mm in front of the VP. Draw its projections and determine the true angles of inclination with the reference planes.

Chart number 4:

1. The top view of a 75 mm long line PQ measures 50 mm. The end P is 15 mm above the HP and 50 mm in front of the VP. The end Q is 20 mm in front of the VP and above the HP. Draw its projections and determine its true angles of inclinations with the reference planes.
2. The front view and top view of a straight line PQ measures 50 mm and 65 mm respectively. The point P is in the HP and 20 mm in front of the VP and the front view of the line is inclined at 45° to the reference line. Determine the true length of PQ true angles of inclinations with the reference planes.

Chart number 5:

1. A 75mm long line PQ has the end P at 15mm above HP and 20mm in front of the VP. The front and top views are 45mm and 60mm long respectively. Determine true inclination with reference plane.
2. The distance between the end projectors of a line PQ is 50 mm. The end P is 50 mm in front of the VP and 25 mm above of the HP. The end Q is 10 mm in front of the VP and above the HP. The line is inclined at 30° to the VP. Draw its projections. Determine its true length and true angle of inclinations with HP.

Chart number 6

1. A line AB has its end A is in HP and 40mm in front of VP. Its front view is inclined at 50° to XY and has a length of 70mm. The other end B is in VP .Draw its projections.
2. A line a'b' is inclined 50° to XY and measures 55mm, while its top view is inclined 60° to XY. End A is 15mm above HP and B is 20mm in front of VP. Draw projections of the line and find true inclination with HP and VP.

PROJECTION OF PLANES

1. A pentagonal plane with a 30mm side, rests on HP, on an edge such that the surface is inclined at 45° to the HP and the edge on which it rests is inclined at 30° to the VP. (Basant Agarwal 10.15).
2. A hexagonal plate of side 30mm is resting on one of its sides on VP and inclined 40° to HP. Its surface is inclined 35° to the VP. Draw its projections. (Jeyapoovan 170)
3. A square lamina PQRS of side 40mm rests on the ground on its corner P in such a way that the diagonal PR is inclined at 45° to the HP and apparently inclined at 30° to VP. Draw its projections. (K.V. Natarajan 203).
4. A rectangular plate of side 50x25mm is resting on its shorter side on HP and inclined 30° to VP. Its surface is inclined 60° to HP. Draw its projections. (Jeyapoovan 169).
5. A thin rectangular plate of size 60x40mm has its shorter edges on the HP. It is inclined such that top view of the plane appears as a square having 40mm side. Draw its projections when the edge resting on the HP is inclined at 30° to the VP (Basant Agarwal 10.23).
6. A circular plate of diameter 80mm has one of its ends of the diameter in the HP while the other end is in the VP. The plane is inclined at 30° to the HP and 60° to VP. Draw its projections. (Basant Agarwal 10.20).

Assignment questions

Chart number 7

1. A pentagonal plate of side 20mm rests on the HP on one of the side 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.

Chart number 8

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

Chart number 9

1. A hexagonal lamina of side 35mm rests on one of its edges on the HP. This edge is parallel to the VP. The surface of the lamina is inclined 60° to the HP. Draw the projections

Chart number 10

1. A rectangular lamina 40 x 70mm is standing on one of its corners with its edges equally inclined to HP. The surface of the lamina is inclined is inclined 30° to VP. The diagonal passing through the resting corner makes 55° with HP. Draw the projections.

Chart number 11

1. A rectangular plate 70x 40mm has one of its shorter edges in the VP and inclined 40° to the HP. Draw projections if its front view is a square of side 40mm .

Chart number 12

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

UNIT III

PROJECTION OF SOLIDS

1. A hexagonal prism having base of 30mm side and 75mm long axis, has an edge of its base on the HP. Its axis is inclined at 45° to the HP and parallel to VP. Draw projections. (Basant Agarwal 11.13).
2. A hexagonal prism having base of 30mm side and 65mm long axis, has an edge of its base on the VP. Its axis is inclined at 30° to the VP and parallel to HP. Draw projections. (Basant Agarwal 11.13).
3. A pentagonal prism, having base with 30mm side and 75mm long axis, has a corner of its base on the ground and axis is inclined 60° to the HP. Draw its projections if the plane containing that corner and the axis is parallel to the VP. (Basant Agarwal 11.20).
4. A hexagonal pyramid of base side 30mm and axis length 60mm is resting on HP on one of its base corners with its base inclined at 55° with HP. The base side containing the resting corner are equally inclined to HP. (Jeyapoovan 228).
5. A cone of base diameter 50mm and axis length 60mm is resting on VP on a point on the circumference of the base with its axis inclined at 40° to VP and parallel to HP. Draw its projections. (Jeyapoovan 259).
6. Draw the projections of a hexagonal prism of base side 20mm and axis length 50mm when it is lying on the ground on one of its rectangular faces and axis inclined 35° to the VP. (K.V. Natarajan 241).
7. A cylinder of diameter 50mm and axis length 70mm is resting on HP on one of its generators with axis inclined at 50° to VP. Draw projections. (Jeyapoovan 256).
8. A pentagonal pyramid of base side 30mm and axis length 60mm is resting on HP on one of its triangular faces with axis parallel to VP. Draw projections (jeyapoovan 256).
9. Draw the projections of the cube of side 40mm when it rests on one of the corners with a solid diagonal vertical. (K.V. Natarajan 250).
10. A pentagonal pyramid of base side 25mm and axis length 60mm rests on one of the base sides on HP such the highest base corner is 20mm above HP and axis is parallel to VP. Draw projections. (K.V. Natarajan 218).
11. A pentagonal prism having a base with a 30mm side and 75mm long axis, has one of its rectangular faces on the HP and the axis is inclined at 60° to VP. Draw its projections. (Basant Agarwal 11.20).
12. A pentagonal pyramid of base side 25mm and an altitude of 45mm. The pyramid rests on the HP on one of its base side such that the triangular face containing that side is perpendicular to both HP and VP. Draw projections. (K.V. Natarajan 218).
13. A pentagonal pyramid of base side 35mm and axis length 70mm is freely suspended by means of a string from one of its base corner with its axis parallel to VP. (Jeyapoovan 216).
14. A cone of base diameter 50mm and axis length 60mm is resting on HP on one of its generators with its axis parallel to VP. Draw its projections. (Jeyapoovan 241).

15. A tetrahedron of edge 50mm is resting on HP on one of its edges with the face containing that edge inclined 35° to HP and perpendicular to VP. Draw projections. (Jeyapooan 246).

Assignment questions

Chart number 13

A hexagonal prism having base of 30mm side and 60 mm long axis, has an edge of its base on the HP. Its axis is inclined at 60° to the HP and parallel to VP. Draw projections.

Chart number 14

A square pyramid of base side 30mm and axis length 60mm is resting on HP on one of its base corners with its base inclined at 40° to HP. Draw the projections.

Chart number 15

A hexagonal pyramid, having base side 30mm and 70mm long axis, has a triangular face on the ground and axis is parallel to VP. Draw projections.

Chart number 16

A cylinder of base diameter 50mm and axis length 70mm is resting on HP on a point on the circumference of the base with the axis inclined at 50° to HP. Draw projections

Chart number 17

A square prism of base side 35mm and axis length 60mm rests on the HP on one of its longer edges with its face equally inclined to HP. Draw its projections when its axis is inclined 30° to VP.

Chart number 18

A cone of base diameter 40mm and altitude 80mm rests on the HP with its axis inclined at 30° to the HP and parallel to the VP. Draw front view and top view.

Chart number 19

A square pyramid of base side 30mm and axis length 60mm is resting on HP on one of its base corners with the axis parallel to VP. Draw projections when the slant edge containing the resting corner is vertical.

Chart number 20

A pentagonal prism having a base with 30mm side and 75mm long axis, has one of its rectangular faces on HP and axis is inclined 60° to VP. Draw its projections.

Chart number 21

A cone having a 50mm diameter and a 70mm axis length, has a point on its base circle in the VP, such that the axis is inclined at 45° to the VP and parallel to HP. Draw the projections.

Chart number 22

A pentagonal pyramid of base side 30mm and axis length 60mm is resting on VP on one of its triangular faces with its axis parallel to HP. Draw its projections.

Chart number 23

A square pyramid of base side 30mm and axis length is suspended by means of a string from one of its base corners with its axis parallel to VP. Draw projections.

UNIT IV
SECTION OF SOLIDS

1. A hexagonal prism base side 30mm and axis length 60mm is resting on HP on one of its base sides with two of the vertical faces perpendicular to VP. It is cut by a plane inclined at 50° to HP and perpendicular and passing through a point at a distance 12mm from the top. (Jeyapoovan 344).
2. A square prism of base side 30mm and height 60mm rests on the HP on one of its ends with two of its rectangular faces equally inclined to the VP. It is cut by a plane perpendicular to the VP and inclined 60° to HP meeting the axis at 15mm from the top. Draw front view, sectional top view and true shape of the section. (K.V. Natarajan 300).
3. A pentagonal prism of base side 40mm, axis length 75mm rests on the HP on one of its ends with a rectangular face parallel to VP. It is cut by a plane perpendicular to VP and inclined at 30° to HP and meeting the axis at 25mm from the top. Draw sectional top view, front view and true shape of the section. (K.V. Natarajan 342).
4. A cube of side 40mm is placed on HP and is cut by a plane in such a way that the true shape of the section is a regular hexagon. Draw front view and top views of the cube and determine inclination with the HP. (Jeyapoovan 351).
5. A cylinder of base diameter 50mm and height 60mm rests its base on HP. It is cut by a plane perpendicular to VP and inclined at 45° to HP. The cutting plane meets the axis at a distance of 15mm from top of the base. Draw sectional plan and true shape of the section. (Jeyapoovan 347).
6. A pentagonal pyramid of base side 40mm and axis length 75mm is resting on HP on its base with one of its base sides parallel to VP. It is cut by a plane inclined at 35° to HP and perpendicular to VP and bisecting the axis. Draw front view, sectional top view and true shape of the section. (Jeyapoovan 342).
7. A hexagonal pyramid of base side 25mm and axis 55mm rests on its base on the HP with two of the base edges perpendicular to VP. It is cut by a plane perpendicular to the VP and inclined at 30° to the HP and meeting the axis 20mm from the vertex. Draw front view, sectional top view and true shape of the section. (K.V. Natarajan 313)
8. A right circular cone of base diameter 40mm and altitude 50mm rests on its base on HP. It is cut by a plane perpendicular to the VP and inclined at 80° to HP, passing through the apex. Draw sectional top view, front view and true shape of the section. (K.V. Natarajan 338).
9. A right circular cone of base diameter 40mm and altitude 50mm rests on its base on HP. It is cut by a plane perpendicular to the VP parallel to one of its generator and 10mm away from it. Draw sectional top view, front view and true shape of the section. (K.V. Natarajan 334).
10. A pentagonal pyramid of base side 30mm and axis length 60mm is resting its base on HP with two of the base sides parallel to VP. It is cut by a plane inclined at 45° to VP and perpendicular to VP and 12mm away from the axis. Draw top view, sectional front view and true shape. (Jeyapoovan 359).

Assignment questions

Chart number 24

A hexagonal prism of base side 30mm and axis length 70mm rests on one of its ends on HP with two of the base sides parallel to VP. It is cut by a plane perpendicular to the VP and inclined at 30° to the HP. The cutting plane meets the axis at a distance of 30mm from one end. Draw the sectional top view, front view and true shape of the section. (K.V. Natarajan 302).

Chart number 25

.A pentagonal prism of base side 30mm, axis length 70mm rests on the HP on one of its ends with a rectangular face perpendicular to VP. It is cut by a plane perpendicular to VP and inclined at 45° to HP and the shortest distance between the axis and cutting plane is 10mm. Draw sectional top view, front view and true shape of the section.

Chart number 26

A hexagonal prism of base side 30mm and axis length 70mm rests on the HP on one of its rectangular faces with its axis perpendicular to VP. It is cut by a vertical plane inclined at 30° to the VP. The cutting plane meets the axis at a distance of 30mm from one end. Draw the top view, sectional front view and true shape of the section.

Chart number 27

A hexagonal prism of base side 30mm and axis length is resting on HP on one of its rectangular faces with its axis perpendicular to VP. It is cut by a plane inclined at 45° to HP and perpendicular to VP and is 12mm away from the axis. Draw front view, sectional top view and true shape of the section.

Chart number 28

A square pyramid of base side 25mm and altitude 40mm rests on HP on its base with its 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 20mm above the HP. Draw sectional top view and true shape of the section.

Chart number 29

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

Chart number 30

A cylinder of diameter 40mm and height 60mm rests on its base on the HP. It is cut by a plane perpendicular to the VP and inclined at 30° to HP. The plane bisects the axis. Draw front view, sectional top view and true shape of the section.

Chart number 31

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

Chart number 32

A right circular cone of base diameter 60mm and axis length 75mm rests on its base on HP. It is cut by a plane perpendicular to the VP and inclined at 30° to HP and bisecting the axis of

the cone. Draw sectional top view and true shape of the section when top half of the sectioned solid is removed.

DEVELOPMENT OF SURFACES

1. A hexagonal prism of base side 20mm and height 45mm is resting on one of its ends on the HP, with two of its parallel faces parallel to the VP. It is cut by a plane perpendicular to the VP and inclined at 30° to HP. The plane meets the axis at a distance of 20mm above the base. Draw the development of the lateral surfaces of the lower portion of the prism. (Basant Agarwal)
2. A cylinder with 50mm base diameter and a 70mm long axis is resting on ground with its axis vertical. A section plane inclined at 45° to HP cuts the cylinder such that the plane passes through the top of one of the extreme generators and cut all the remaining generators. Draw the development of the lateral surface. (Basant Agarwal 13.5).
3. A cone of base diameter 50mm and axis length 70mm rests with its base on HP. A section plane perpendicular to VP and inclined at 35° to HP and it bisects the axis. Draw the development of the truncated cone. (Jeyapoovan)
4. A cone of base diameter 60mm and height 70mm is resting with its base on the ground. It is cut by a plane perpendicular to VP and parallel to HP at a distance 20mm from the vertex. It is also cut by a plane inclined at 40° to the base and meeting the axis at a point 20mm above the base. Draw the development of the lateral surface of the cut cone. (K.V. Natarajan 375)
5. A cone of base diameter 60mm and height 70mm rests vertically with its base on the ground. A string is wound the curved surface of the cone starting from 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 the front and top view (K.V. Natarajan 379).
6. A square pyramid of base side 30mm and altitude 65mm is resting on HP on its base with a side of the base inclined at 25° with VP. It is cut by a plane inclined at 35° to HP and perpendicular to VP and bisects the axis. Draw the development of the remaining lower portion of the pyramid. (Jeyapoovan 401).
7. A hexagonal pyramid of base of side 25mm and height 50mm is resting vertically on its base on the ground with two of the base sides perpendicular to VP. It is cut by a plane perpendicular to the VP and inclined at 40° to the HP. The plane bisects the axis of the pyramid. Draw the development of the lateral surface of the pyramid.

Assignment questions

Chart number 33

A square prism, having base with a 30mm side and a 60mm axis, is resting on its base on the ground with a side of the base of the base inclined at 30° to VP. It is cut by a plane inclined at 45° with the HP and perpendicular to VP and is bisecting the axis. Draw the development of the remaining portion of the prism.

Chart number 34

A hexagonal prism of base side 20mm and height 45mm is resting on one of its ends on the HP, with two of its lateral faces parallel to VP. It is cut by a plane perpendicular to the VP and inclined at 30° to the HP. The plane meets the axis at a distance of 20mm above the base. Draw the development of the lateral surface of the lower portion of the prism.

Chart number 35

Draw the development of the lateral portion of the right portion of the cylinder with 50mm base diameter and height 65mm is cut by a plane inclined at 60° to the base passing through the axis at a height of 40mm above the base.

Chart number 36

A hexagonal prism of base side 30mm and height 65mm stands on one of its ends on the HP with two of the vertical faces parallel to VP. A circular hole of diameter 40mm is drilled completely through the prism in such a way that 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 surface of the prism showing the shapes of the holes formed on it.

Chart number 37

A cone of base diameter 70mm and axis length 90mm is resting with its base on the HP. It is cut by a plane perpendicular to VP and inclined to the HP cuts the cone and passes through left extreme base point of the cone and the midpoint of the axis Draw the development of the lateral surface of the truncated cone.

Chart number 38

A pentagonal pyramid of base side 25mm and altitude 50mm rests on its base on HP with two of the sides of the base parallel to the VP. It is cut by a plane bisecting the axis. The cutting plane is inclined at 30° to the base and perpendicular to the VP. Draw the development of the lateral surfaces of the lower part of the cut pyramid.

UNIT V

ISOMETRIC & PRESPECTIVE PROJECTIONS

ISOMETRIC PROJECTIONS

1. Draw the isometric view of a frustum of a hexagonal pyramid when it is resting on its base on the HP with two sides of the base parallel to the VP. The side of base is 20 mm and top 8 mm. The height of the frustum is 55 mm.
2. A hexagonal prism of base side 30 mm and axis length 60 mm rest on the HP with two base edge parallel to the VP. It is cut by as section plane perpendicular to VP and inclined at 50° to the HP bisecting the axis of the prism. Draw the isometric view of the truncated prism.
3. Draw the isometric view of a cylinder of diameter 46 mm and height 60 mm. when it is resting on one of its ends on the HP. It is cut by a plane perpendicular to the VP and inclined at 45° to the HP. The plane passes through a point on the axis located at 15 mm from the top.
4. A cone of base diameter 50 mm and height 55 mm is resting on its base on the HP. It is cut by a plane perpendicular to the VP and inclined at 30° to HP. The plane meets the axis at a distance of 25 mm from the apex. Draw the isometric view of the truncated cone.
5. A cylinder of base diameter 30 mm and axis 50 mm is placed on its base centrally on the top of a square slab of side 50 mm and thickness 20 mm. Draw the isometric projection of the combination of the solid.
6. Draw the isometric view of the frustum of a cone of height 30mm, base diameter 34 mm, top diameter 20mm when it is centrally placed over a square slab of side 50 mm and thickness 10 mm.
7. Draw the isometric projection of a sphere of diameter 16 mm kept centrally over a frustum of a square pyramid of height 25 mm. the frustum has a base offside 35 mm and top side 20 mm.
8. A waste paper basket is in the form a frustum of hexagonal pyramid with base 40 mm hexagon and the top 60 mm. draw the isometric view if height is 100 mm the thickness of the basket can be taken as 10mm.

PRESPECTIVE PROJECTIONS

1. A regular hexagonal pyramid of base edge 20 mm and height 35 mm rest on its base on the Ground plane(GP) with one of its base edges touching the Picture Plane (PP). Station point is 30 mm above the GP and 40 mm in front of the PP. the Central plane is 30 mm to the right of the axis. Draw the perspective projection of the pyramid by Visual Ray method.
2. A square prism of base 25 X 25 mm and height 40 mm rest on the GP on one of its ends with a rectangular face receding away from the PP towards right making 60° with PP. The Corner nearest to the PP is 40 mm to the left of the station point and 20 mm behind the PP. The station point is 60 mm above the GP and 50 mm in front of the PP. Draw the perspective projection of the prism by Visual Ray method.
3. Draw the perspective view of the square prism of base side 20 mm and height 35 mm resting on an end on the ground with the rectangular face parallel to PP. The axis of the prism is 25 mm behind the PP and 25 mm to the right of the eye. The eye is 50 mm in front of the PP and 50 mm above the ground.
4. Draw the perspective view of the square pyramid of base edge 20 mm and altitude 40 mm resting on an end on the ground with the rectangular face parallel to PP. The axis of the pyramid is 25 mm behind the PP and 25 mm to the right of the eye. The eye is 50 mm in front of the PP and 50 mm above the ground.

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UNIT 5

ISOMETRIC & PRESPECTIVE PROJECTIONS

Chart number 39:

A frustum of a square pyramid of bottom base 50 mm and top base 25 mm has an height of 70 mm and rests on HP with its bottom base and one edge parallel to VP. Draw the isometric view of the frustum.

Chart number 40:

Draw the isometric projection of the frustum of a cone of base diameter 60 mm and top base diameter 35 mm and axis length 50 mm rests on HP on its base.

Chart number 41:

An inverted frustum of a cone of base diameter 40 mm and top diameter 20 mm and axis length 30 mm is placed centrally over a cylinder of diameter 70 mm and 40 mm height. Draw the isometric view of the combined solid.

Chart number 42:

Draw an isometric projection of a pentagonal pyramid of base side 30 mm and height 60 mm resting on its base on HP with one of its base edge parallel to VP. It is cut by a plane perpendicular to VP and inclined at 45° to HP. The plane passes through a point on the axis located at 30mm from the apex.

Chart number 43

A cylinder of 50 mm diameter and height 60 mm stands on HP. A section plane is perpendicular to VP inclined at 55° to HP cuts a cylinder and passes through a point on the axis at the height of 45 mm above the base. Draw the isometric view of truncated portion of the cylinder.

Chart number 44:

A cone of base diameter 50 mm and height 75 mm rest on HP with its base. A section plane cuts the axis of the cone at a height of 45 mm from the base and inclined at 35° to the HP. Draw the isometric view of the remaining part of the cone.

Chart number 45:

Draw the perspective projection of cube of 25 mm edge lying in a face on the GP with an edge touching the PP and all vertical faces equally inclined to PP. The station point is 50 mm in front of the PP 35 mm above the GP and lies in central plane which is 10 mm to the left of the center of the cube.

Chart number 46:

Draw the perspective projection of square prism of base 40 mm and length 60 mm lying on a rectangular faces on the ground, with a corner on PP and the base equally inclined to PP. The station point is 60 mm in front of the PP 80 mm above the GP and lies in central plane which is passing through the center of the prism.

Chart number 47:

A square prism of base 25 X 25 mm and height 40 mm rest on the GP with the edges of the base making 45° with PP. The Corner nearest to the PP is 25 mm to the right of the station point and 25 mm behind the PP. The station point is 55 mm above the GP and 70 mm in front of the PP. Draw the perspective projection of the prism by Visual Ray method.

Chart number 48:

A pentagonal prism of base side 30 mm and height 50 mm resting with the base on the ground plane and one of its edges parallel to the PP line and 10 mm behind it. The station point is 45 mm in front of the edge nearest to the PP and 65 mm above GP and lies on the central plane which is 45 mm to the left of the center of the prism. Draw the perspective projection.

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Unit I

CONIC SECTION

1. Draw the locus of a point that moves in such a way that the ratio of the distance from a fixed point is $\frac{2}{3}$. The actual difference between the fixed line and the fixed point is 50mm. Draw a tangent and normal to the curve at a distance of 70mm away from the fixed straight line. (Basant Agarwal page 5.6).
2. Draw a parabola given the distance of the focus from the directrix as 60mm and also draw a tangent and normal at any point on the curve.(K.V.Natarajan 53).
3. Draw a conic curve given the distance of the focus from the directrix as 55mm and eccentricity as 1.5 .(K.V.Natarajan 60).
4. A circle of 50mm diameter rolls on a straight line without slipping. Trace the locus of a point 'P' on the circumference of the circle rolling for one revolution. Name the curve . Draw normal and tangent to the curve at any point on the curve.(Jeyapoovan)
5. An inelastic string has one of its ends attached to the circumference of a circular disc of diameter 30mm. Draw the curve traced out by the other end of the string when it is completely wound around the disc keeping the string always tight. Name the curve obtained. Draw tangent and normal at a distance 65mm from the centre of the circle. (Jeyapoovan).
6. Draw the involute of various polygons of side 40mm.

Assignment questions

Chart number 49

Draw an ellipse when the eccentricity is $\frac{2}{3}$ and the distance of the focus from the directrix is equal to 50mm. Also draw a normal and tangent to a point on the ellipse which is at a distance of 70mm from the directrix.

Chart number 50

Draw an conic curve with eccentricity is one when the distance between fixed line and fixed point is 60mm.

Construct a hyperbola with the distance between focus and directrix as 50mm and eccentricity as $\frac{3}{2}$. Also draw the tangent and normal at a point , 25mm from the axis.

Chart number 51

Draw a cycloid given the diameter of the generating circle as 40mm.

Draw an involute of a circle of diameter 40mm.(K.V.Natarajan 68).

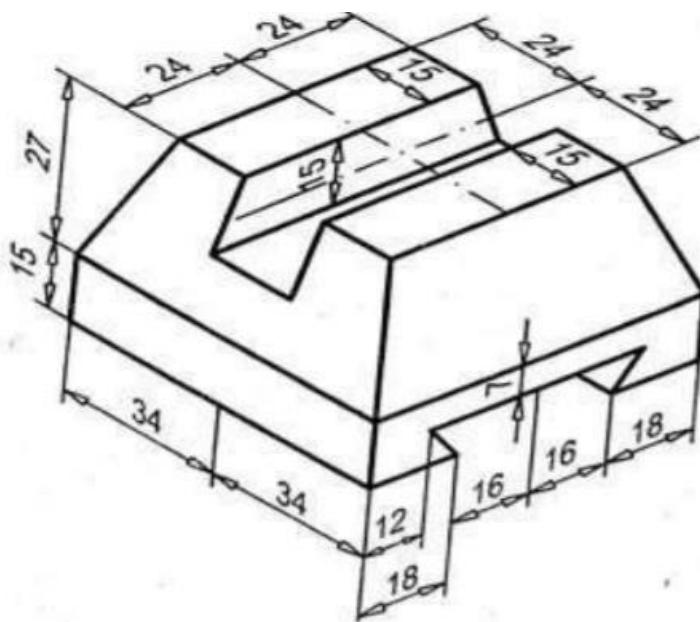
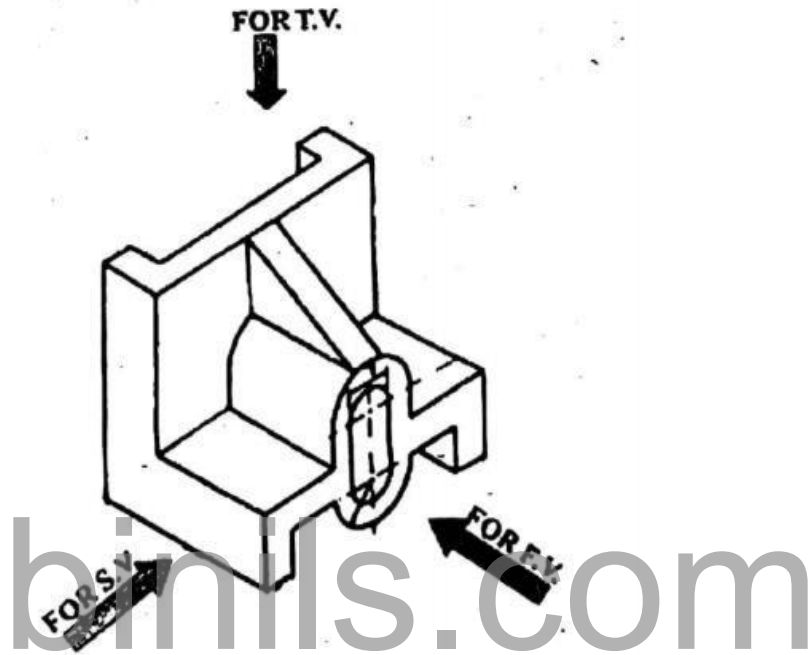
Chart number 52

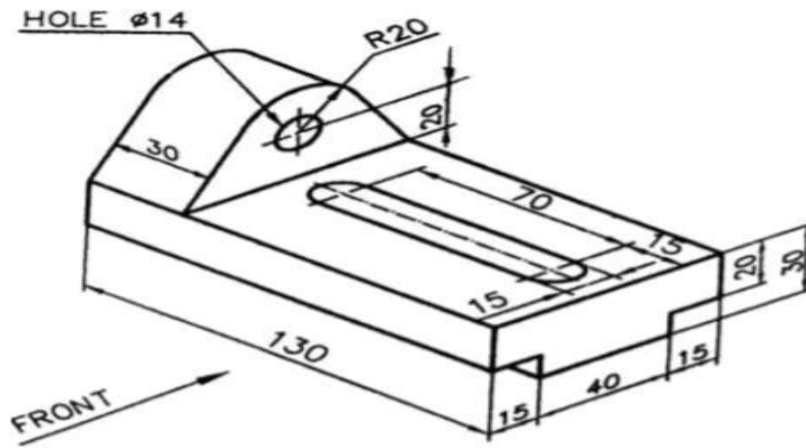
1. An inelastic string of 150mm length has its one end attached to the bottom most point of the circumference of a circular disc of 40mm diameter. Draw the curve traced by the other end of the string when it is completely wound around the disc keeping the string always tight. Name the curve. Draw the tangent and normal to the curve at a point 100mm from the centre of the disc.
2. Draw locus of a point on the periphery of a circle having diameter of 50mm which rolls on a straight line path. Name the curve and draw a tangent and normal at any point Q on it.

FREE HAND SKETCHING

Chart number 53

Sketch by free hand front view ,top vie and right side view of the object shown below.





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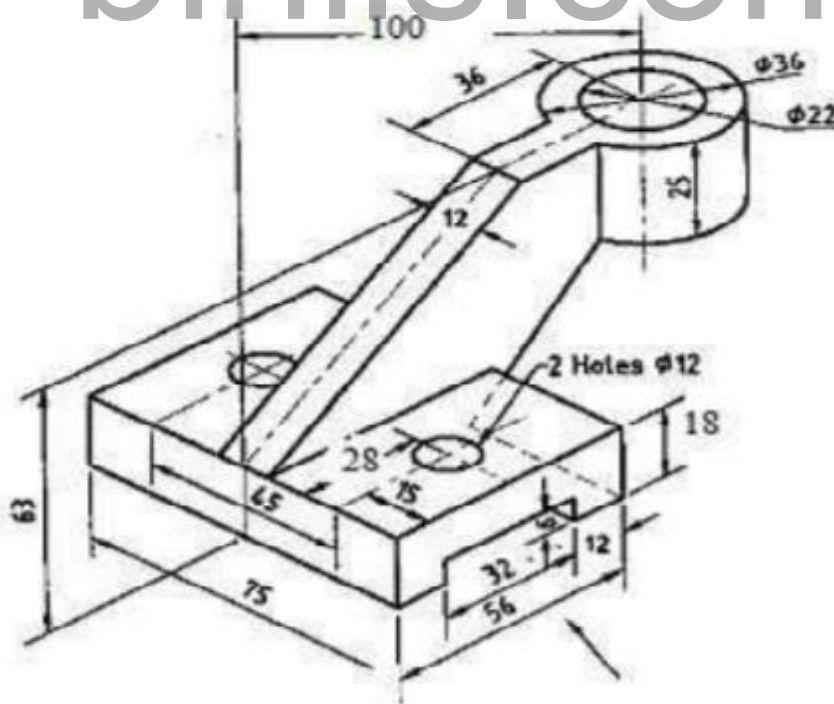
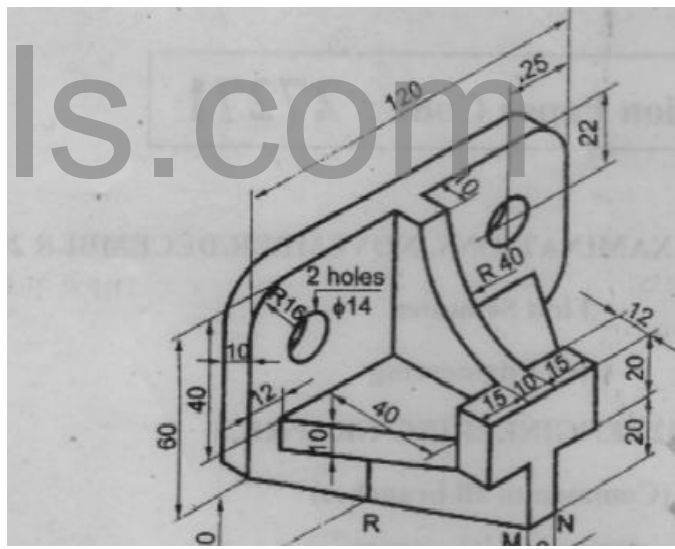
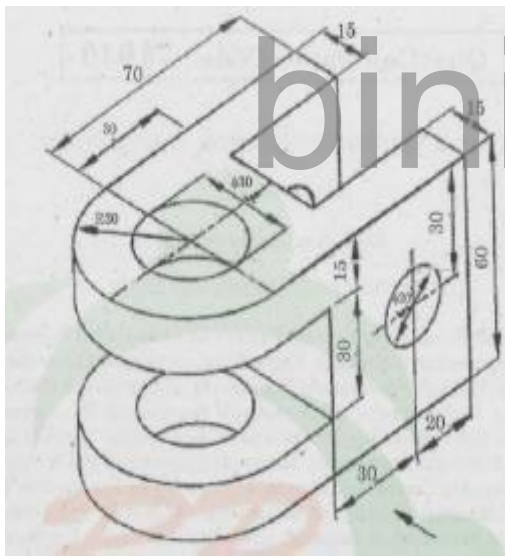
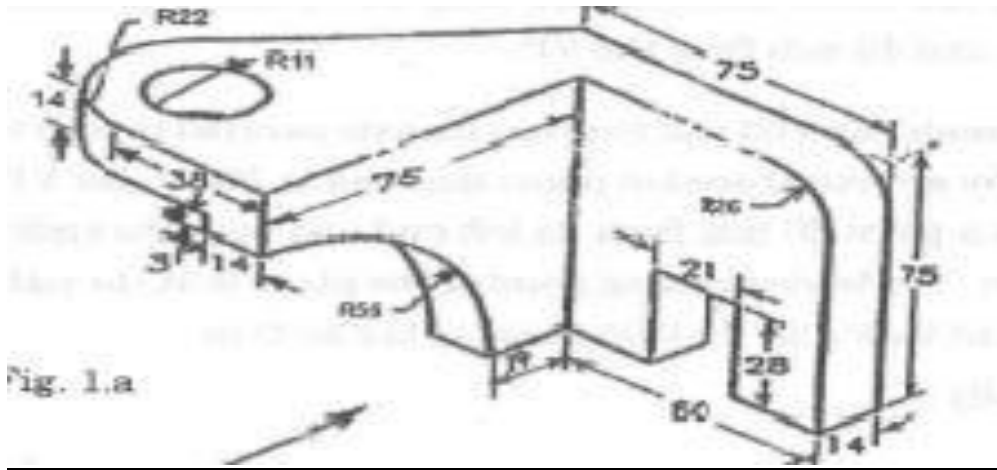
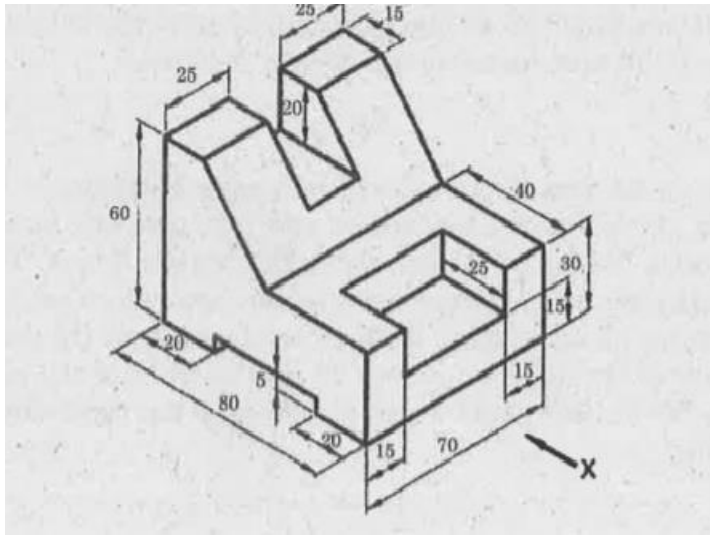


Chart number 54





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