DRONACHARYA
GROUP OF INSTITUTIONS

LABORATORY MANUAL

ENGINEERING GRAPHICS AND DESIGN LAB

SUBJECT CODE: BCE-251

B.TECH (ME) SEMESTER -II

Academic Session: 2022-23, Even Semester

Student Name:	
Roll. No.:	
Branch/Section:	

Dronacharya Group of Institutions

Plot No. 27, Knowledge Park-3, Greater Noida, Uttar Pradesh 201308

Affiliated to

Dr. A P J Abdul Kalam Technical University

Lucknow, Uttar Pradesh 226031

Table of Contents

Vision of the Institute

"To impart Quality Education, to give an enviable growth to seekers of learning, to groom them as World Class Engineers and Managers competent to match the expanding expectations of the Corporate World has been ever enlarging vision extending to new horizons of Dronacharya Group of Institutions."

Mission of the Institute

We, at Dronacharya Group of Institutions, are absolutely committed to serve the society and improve the mode of life by imparting high quality education in the field of Engineering and Management catering to the explicit needs of the students, society, humanity, and industry. 'Shiksha evam Sahayata'. i. e. Education and help are the two words etched on our banner soaring higher year after year.

Vision of Applied Science Department

1. To be a center of excellence in education in the field of physics, chemistry,
mathematics and other related interdisciplinary sciences with ethical and social
values.

Mission of Applied Science Department

1. To provide quality education by providing state of the art facility
2. To educate the students by giving them a blend of knowledge of applied and interdisciplinary sciences.
3. To make students conscious of ethical and social values in pursuing their education and profession .

Program Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO 9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEOs)

PEO 1. Engineers will practice the profession of engineering using a systems perspective and analyze, design, develop, optimize & implement engineering solutions and work productively as engineers, including supportive and leadership roles on multidisciplinary teams.

PEO 2. Continue their education in leading graduate programs in engineering & interdisciplinary areas to emerge as researchers, experts, educators & entrepreneurs and recognize the need for, and an ability to engage in continuing professional development and life-long learning.

PEO 3. Engineers, guided by the principles of sustainable development and global interconnectedness, will understand how engineering projects affect society and the environment.

PEO 4. Promote Design, Research, and implementation of products and services in the field of Engineering through Strong Communication and Entrepreneurial Skills.

PEO 5. Re-learn and innovate in ever-changing global economic and technological environments of the 21st century.

University Syllabus

Unit-1: Introduction to Engineering Drawing and Orthographic Projections 8 Principles of Engineering Graphics and their significance. Dimensioning, Lettering. Scales: Plain, Diagonal and Engineering Scales. Orthographic Projection, Projection of Point, Projection of Lines: Projection of straight lines; Projection of lines inclined to one plane and both planes.

Unit-2: Projection of Planes and Solids 8 Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes. Classification of solids, Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

Unit-3: Sections of Regular Solids and development of Surfaces 8 Sections of Solids: Right regular solids and Auxiliary views for the true shape of the sections such as Prism, Cylinder, Pyramid, and Cone. Development of surfaces for various regular solids such as Prism, Cylinder, Pyramid and Cone.

Unit-4: Isometric Projection 8 Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids. Perspective Projection: Orthographic representation of perspective views — Plane figures and simple solids — Visual Ray Method. Conversion of pictorial view into orthographic Projection.

Unit-5: Introduction to Computer Aided Design 8 Introduction to AutoCAD: Basic commands for 2D drawing: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc. Transformation of Projections: Conversion of Isometric Views to Orthographic Views and Vice-Versa in AutoCAD. Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form

Course Outcomes

CO.1	Use scales and draw projections of objects.
CO 2	Explain views of solids and their sectional surfaces.
CO 3	Analyze and draw isometric projections of objects.
CO 4	Demonstrate orthographic representation of perspective views using modern tools.
CO 5	Apply AutoCAD software for creation of engineering drawing and models

Course Overview

In Engineering Graphics and Design lab Students will gain practical experience with designing and implementing concepts of Engineering Drawing.The main objective of course is to prepare the students for the effective technical communication and also provide them exposure of techniques, skills, and modern engineering tools necessary for engineering practice. The course must prepare the students to design a system, component, or process to meet desired needs within realistic constraints around them in professional life.

DOs and DON'Ts

DOs

1. Drafter and Sheets are mandatory for each students to take the classes .
2. Arrange your chair properly when you are leaving the lab.
3. Put your bags in the designated area.

DON'Ts

1. Tea, Coffee, Water & Eatables are not allowed in the Engineering and Graphics Lab
2. Late entries are not allowed in lab.

General Safety Precautions

Precautions (In case of Injury or Electric Shock)

1. To break the victim with live electric source, use an insulator such as firewood or plastic to break the contact. Do not touch the victim with bare hands to avoid the risk of electrifying yourself.
2. Unplug the risk of faulty equipment. If the main circuit breaker is accessible, turn the circuit off.
3. If the victim is unconscious, start resuscitation immediately, use your hands to press the chest in and out to continue breathing function. Use mouth-to-mouth resuscitation if necessary.

Precautions (In case of Fire)

- Turn the equipment off. If the power switch is not immediately accessible, take plug off.
- If fire continues, try to curb the fire if possible, by using the fire extinguisher or by covering it with a heavy cloth if possible isolate the burning equipment from the other surrounding equipment.
- Sound the fire alarm by activating the nearest alarm switch located in the hallway.

Guidelines to Students for Report Preparation

All students are required to maintain a record of the Sheets Prepared by them. Guidelines for its preparation are as follows:-

1) All Sheets must contain a title box. ***The Sheets will not be signed by the faculty without an entry in the Title Box .***

2) Student's Name, Roll number and date of conduction of experiment must be written on all Sheets prepared by them.

3) For each experiment, the record must contain the following

(i) Aim/Objective of the experiment

(ii) Pre-experiment work (as given by the faculty)

(v) Results/ output in the form of sheet prepared

Note:

1. Students must bring their Sheets along with them whenever they come for the lab.

2. Students must ensure that their lab record is regularly evaluated.

List of Experiments mapped with COs

S. No	Aim of the	COs
1.	To prepare a sheet on Lettering, dimensions & Scales	**CO1**
2.	To prepare a sheet on Projection of point & lines	**CO1**
3.	To prepare a sheet on Projection of planes	**CO2**
4.	To prepare a sheet on Projection of solids	**CO2**
5.	To prepare a sheet on section of solids	**CO3**
6.	To prepare a sheet on Development of surfaces	**CO3**
7.	To prepare a sheet on orthographic & Isometric projections	**CO4**
8.	To draw basic geometrical entities using Auto cad software	**CO5**

Experiment Number -1

AIM: To prepare a sheet of alphabets, numbers, types of lines and scales.

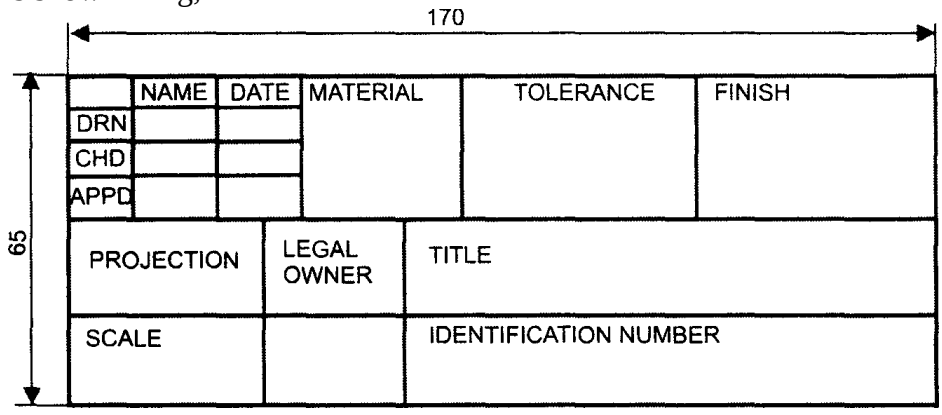
APPARATUS USED : Drawing board, blank full size sheet, mini drafter, geometry box, H, 2H pencils.

THEORY: The sample alphabets are given in the lab manual as provided. The alphabets are drawn on blank sheet in upright position and at an angle with the vertical. The space between the two alphabets is kept constant. The letters are drawn both in upper case and lower case. Similarly, the numbers are drawn from 0 to 9 with regular spacing between them. Similarly, a description of lines has to done in tabular form including information like type of line, representation and its application. It is not convenient, always, to draw drawings of the objects in actual size. E.g. Buildings, Heavy Machines, bridges, watches etc. Hence scales are used to prepare drawing at
• Full size • Reduced Size • Enlarged size

A scale is defined as the ratio of the linear dimensions of the object as represented in a drawing to the actual dimensions of the same.

Title Block:

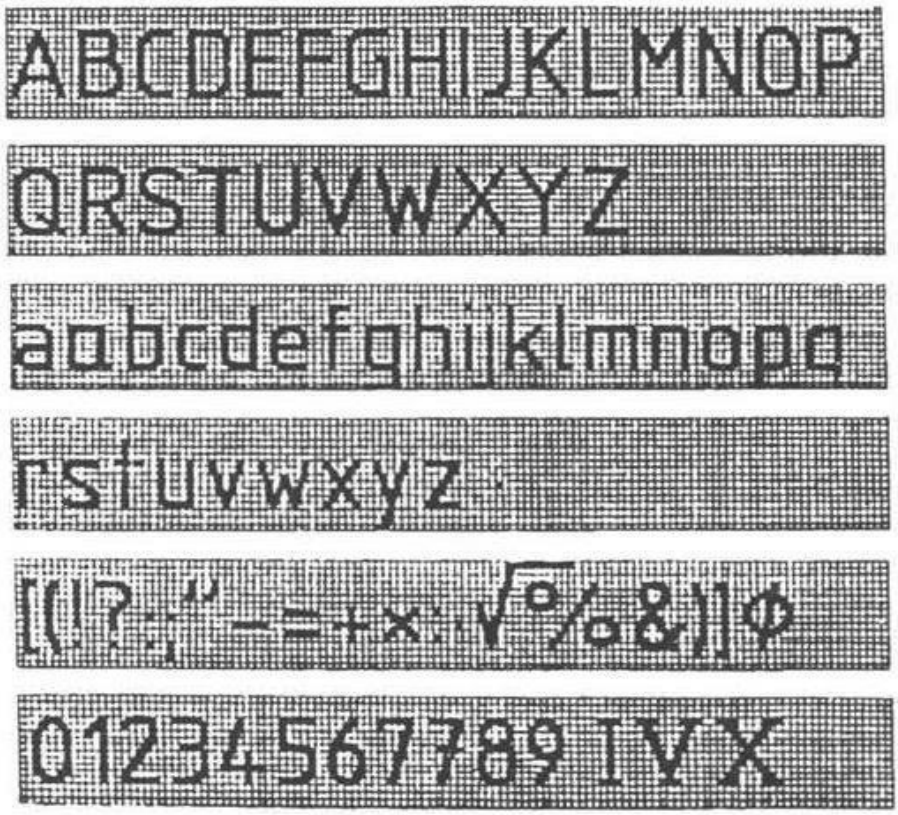
The title block should lie within the drawing space at the bottom right hand comer of the sheet. The title block can have a maximum length of 170 mm providing the following information. 1. Title of the drawing. 2. Drawing number. 3. Scale. 4. Symbol denoting the method of projection. 5. Name of the firm, and 6. Initials of staff, who have designed, checked and approved. The title block used on shop floor and one suggested for students class-work is shown in fig;



Lettering practice

The following are some of the guide lines for lettering

1. Drawing numbers, title block and letters denoting cutting planes, sections are written in 10 mm size.
2. Drawing title is written in 7 mm size.
3. Hatching, sub-titles, materials, dimensions, notes, etc., are written in 3.5 mm size.
4. Space between lines = ~ h.
5. Space between words may be equal to the width of alphabet M or 3/5 h.
6. Space between letters should be approximately equal to *1/5* h. Poor spacing will affect the visual effect.



The spacing between two characters may be reduced by half if h is given a better visual effect, as for exampleLA, TV; over lapped in case of say LT, TA etc, and the space is increased for letters with adjoining stems

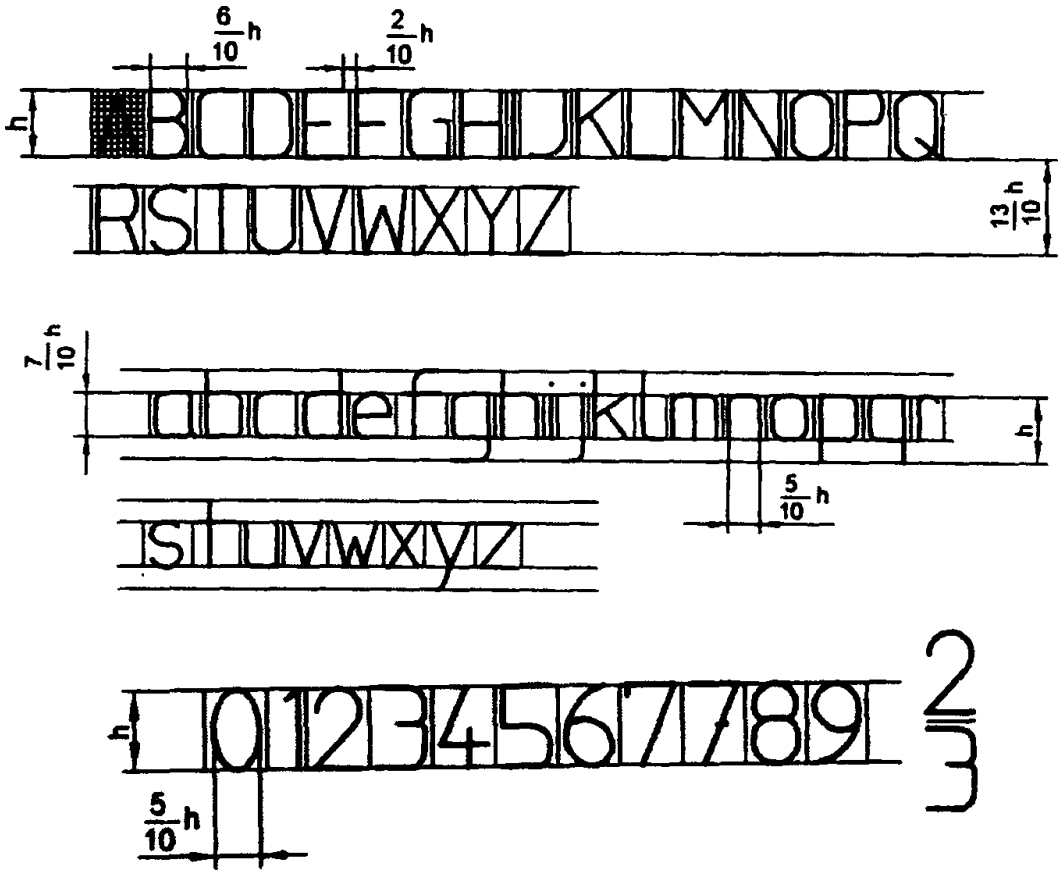
CAPITAL Letters

- Ratio of height to width for most of the CAPITAL letters is approximately = 10:6
- However, for M and W, the ratio = 10:8 for I the ratio = 10:2

Lower-case Letters

- Height of lower-case letters *with* stem *I* tail (b, d, f, g, h, j, k, I, p, q, t, y) = Cz = c3= h
- Ratio of height to width for lower-case letters *with* stem or tail = 10:5
- Height of lower-case letters *without* stem or tail c1 is approximately = *(7/10)* h
- Ratio of height to width for most lower-case letters *without* stem or tail = 7: 5

However, for m and w, the ratio = 7: 7. For I and I, the ratio = 10



Principles of Dimensioning:

Some of the basic principles of dimensioning are given below.

1. All dimensional information necessary to describe a component clearly and completely shall be writtendirectly on a drawing.
2. Each feature shall be dimensioned once only on a drawing, i.e., dimension marked in one view need not berepeated in another view.
3. Dimension should be placed on the view where the shape is best seen.
4. As far as possible, dimensions should be expressed in one unit only preferably in millimeters, withoutshowing the unit symbol (mm).
5. As far as possible dimensions should be placed outside the view.

Experiment Number -2

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AIM: To prepare a sheet of projections of the given points and lines .

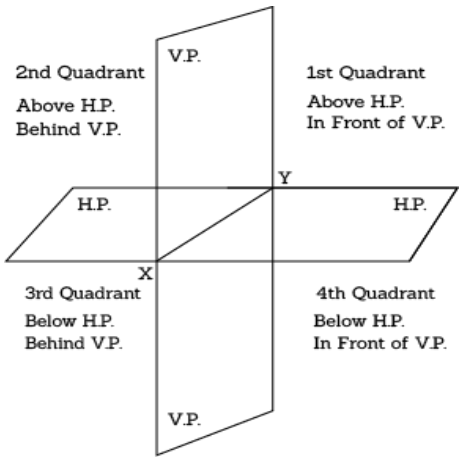
APPARATUS USED: Drawing board, blank full size sheet, mini drafter, geometry box, H, 2H pencils.

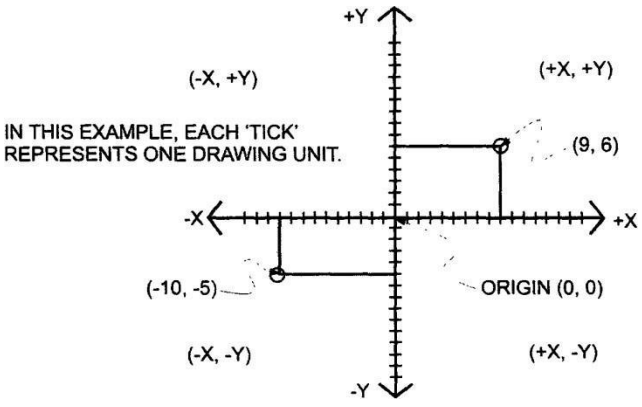
THEORY: The projection is defined as the shadow of any object. A point is a dimensionless entity hence its projection can be drawn in any of the four quadrants.

There are four types of projections:

1. First angle projection
2. Second angle projection
3. Third angle projection
4. Fourth angle projection

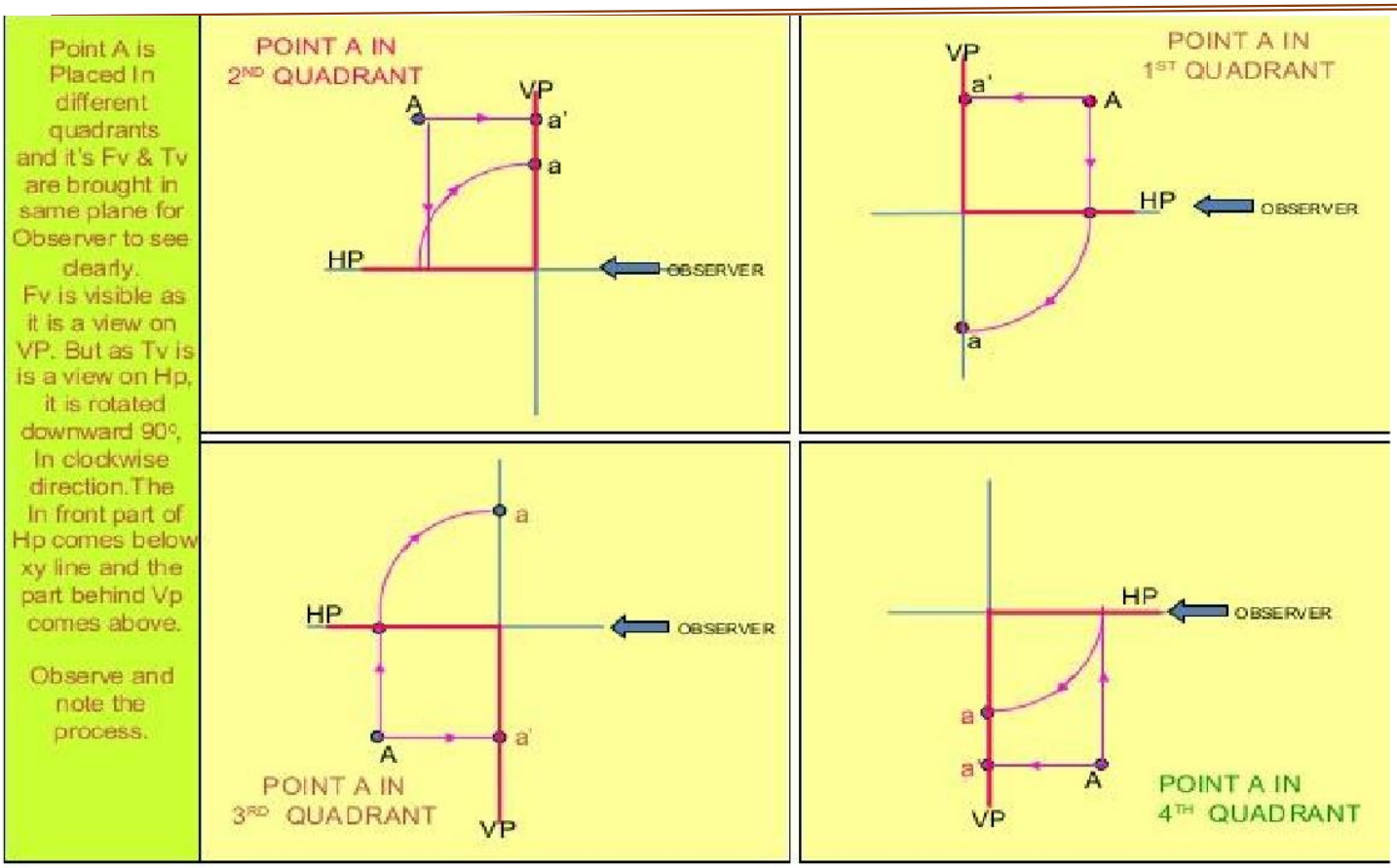
The position of a point in engineering drawing is defined with respect to its distance from the three principle planes i.e., with respect to the VP, HP, & PP.





PROCEDURE:

- Locate the point in quadrant as per description in the question.
- Draw its front view on VP.
- Draw the top view on HP.
- Rotate the top view by 90 degree clockwise to obtain both FV and TV in the same vertical lineseparated by a reference line.
- Show the positions of FV and TV with dimensions with respect to reference line.


Point A is Placed In different quadrants and it's Fv & Tv are brought in same plane for Observer to see clearly.
Fv is visible as it is a view on VP. But as Tv is is a view on Hp, it is rotated downward 90°, In clockwise direction. The In front part of Hp comes below xy line and the part behind Vp comes above.
Observe and note the process.
POINT A IN 2ND QUADRANT
POINT A IN 1ST QUADRANT
POINT A IN 3RD QUADRANT
POINT A IN 4TH QUADRANT
VP
HP
OBSERVER
A
a
a'
12/18/13
Hareesha N G, DSCE, Blore
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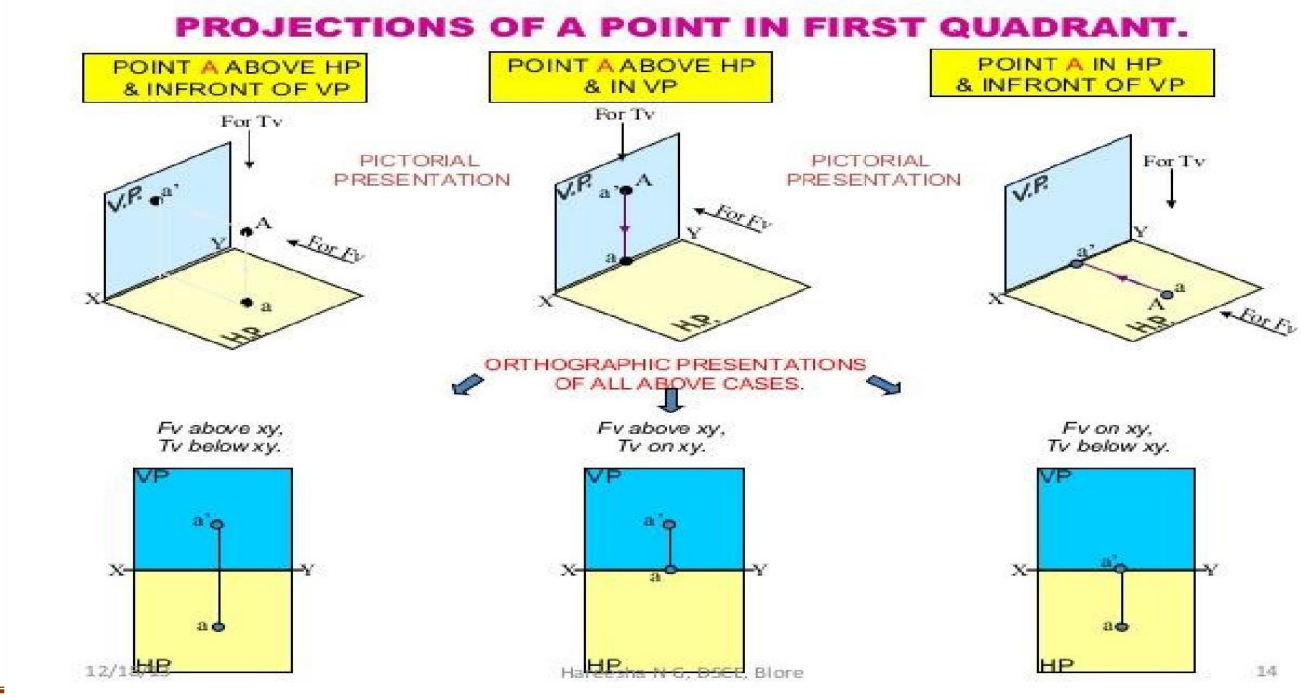

PROJECTIONS OF A POINT IN FIRST QUADRANT.
POINT A ABOVE HP & INFRONT OF VP
POINT A ABOVE HP & IN VP
POINT A IN HP & INFRONT OF VP
PICTORIAL PRESENTATION
PICTORIAL PRESENTATION
For Tv
For Fv
V.P.
H.P.
X
Y
ORTHOGRAPHIC PRESENTATIONS OF ALL ABOVE CASES.
Fv above xy, Tv below xy.
Fv above xy, Tv on xy.
Fv on xy, Tv below xy.
VP
HP
a'
a
12/18/13
Hareesha N G, DSCE, Blore
14

PROJECTION OF LINE: The shadow of a line obtained on HP and VP is known as projection of line

THEORY: Line is the shortest distance between two points is called line. It has length but negligible thickness.

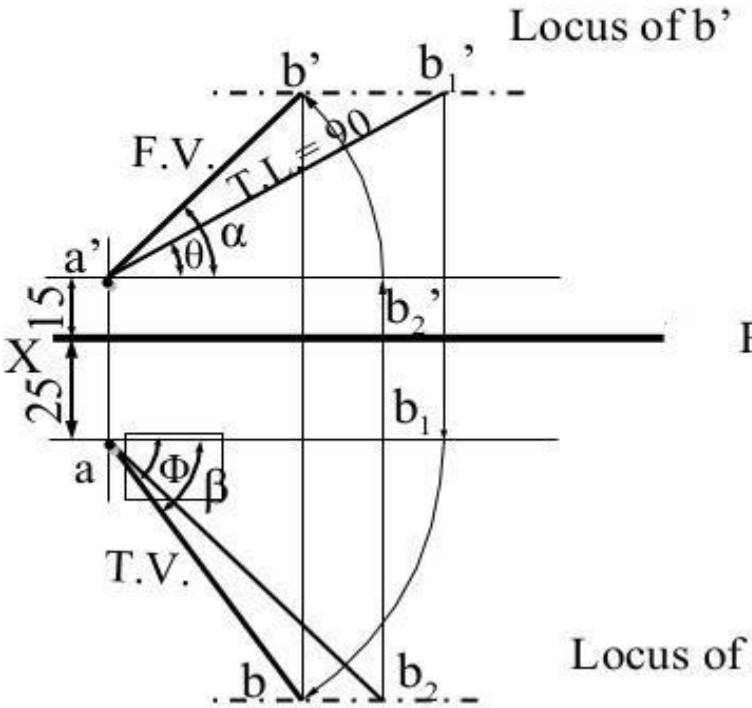
POSITIONS OF STRAIGHT LINES: The position of straight line in a space can be fixed if their inclinations with reference planes and distance of its extremities from the two planes are known. The following are the important positions which a straight line can take with respect to two reference planes.

DIFFERENCE BETWEEN FIRST ANGLE PROJECTION AND THIRD ANGLE PROJECTION:

FIRST ANGLE PROJECTION	THIRD ANGLE PROJECTION
Object is kept in the first quadrant	Object is kept in the third quadrant
Object lies between observer and the plane of projection	Plane of projection lies between observer and the object
The plane of projection is assumed to be opaque	The plane of projection is assumed to be transparent.
Front view is drawn above the XY line	Front view is drawn below the XY line
Top view is drawn below the XY line	Top view is drawn above the XY line
Left view is projected on the right plane and vice versa	Left view is projected on the left place itself
Followed in India, European countries	Followed in USA

PROCEDURE:

Problem : A Line AB, 90 mm long, is inclined to H.P. by 30° and inclined to V.P. by 45°. The line is in first quadrant with Point A 15 mm above H.P. and 25 mm in front of V.P. Draw the projection of line AB.



Data Given :-

(1) T.L.=90 mm

(2) Θ =30°

(3) Φ =45°

Point A — 15 above H.P., 25 mm in Front of V.P.

Answers :-

(1) F.V.= 64 mm

(2) T.V = 78 mm

(3) □ =45° (4) □ = 55°

1. Draw reference line XY.
2. Draw locus lines which are parallel to Reference line at given distance
3. Draw true length in particular plane with reference specific given data.
4. Draw projection lines from end points of true length.
5. Draw apparent line in with the help of projections.
6. Give the name to line in both the views
7. Text with suffix for F.V and plain text for T.V
8. Show all necessary dimensions
9. Write the given problem on the sheet

Experiment Number -3

AIM: To prepare a sheet of the projections of given plane surfaces.

APPARATUS USED: Drawing sheets, Complete Engineering Drawing Box, Mini Drafter,

THEORY:

PLANE: A flat surface generated by moving a straight line in space is called plane.

TYPE OF A PLANE: Following are the two types of plane used in engineering drawing:

1. Perpendicular plane
2. Oblique Plane

PERPENDICULAR PLANE:

The planes which are perpendicular to both the reference plane i.e., HP and VP are calledperpendicular plane. These planes can be located in different manner:

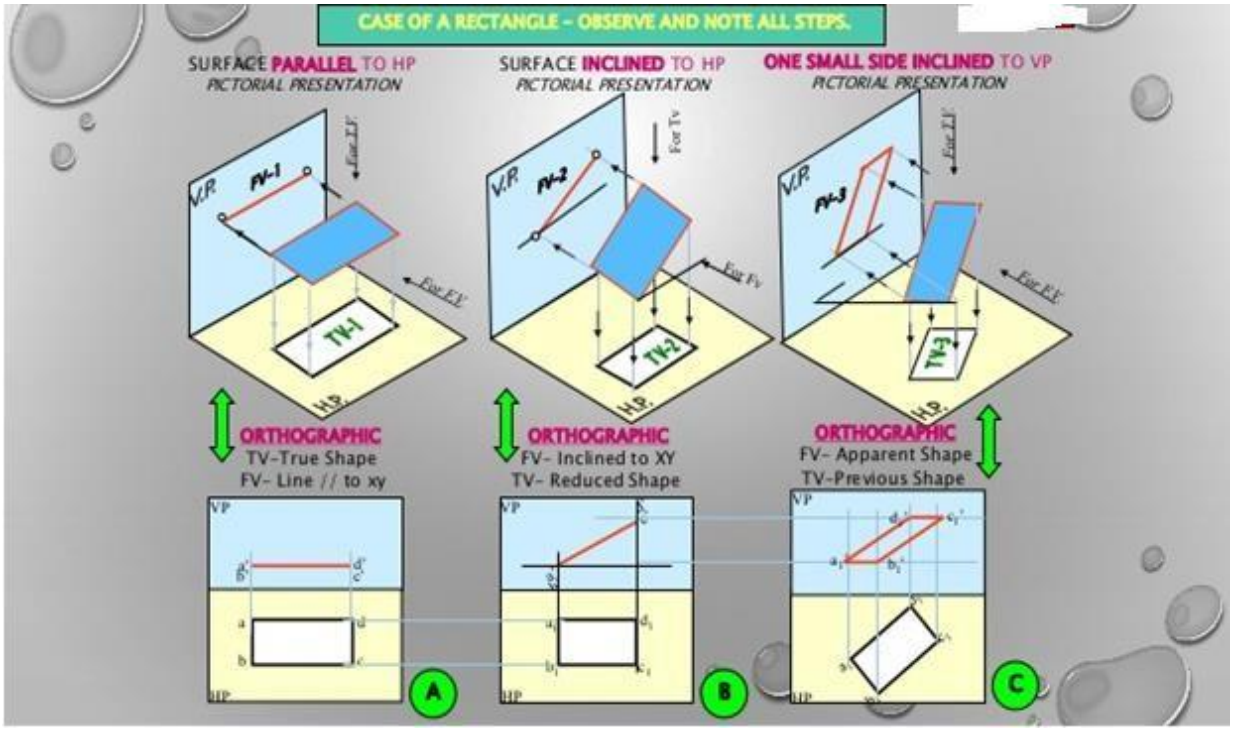
1. Plane perpendicular to HP and parallel to VP
2. Plane perpendicular to VP and parallel to HP

Plane perpendicular to both the reference planes VP &HP

1. Plane perpendicular to HP and inclined to VP.
2. Plane perpendicular to VP and inclined to HP

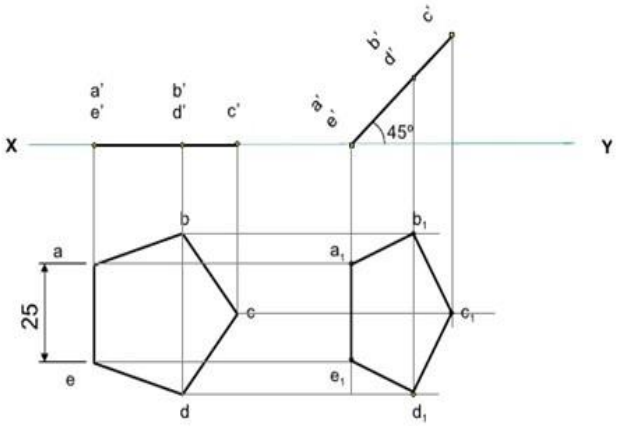
PROCEDURE:

1. Draw reference line XY.
2. Draw the plane of required edges.
3. Draw projection lines from end points of the polygon.
4. Draw apparent shape with the help of projections.
5. Show all necessary dimensions.
6. Write the given problem on the sheet



Q : A regular pentagon of 25mm side has one side on the ground. Its plane is inclined at 45° to the HP and perpendicular to the VP. Draw its projections and show its traces

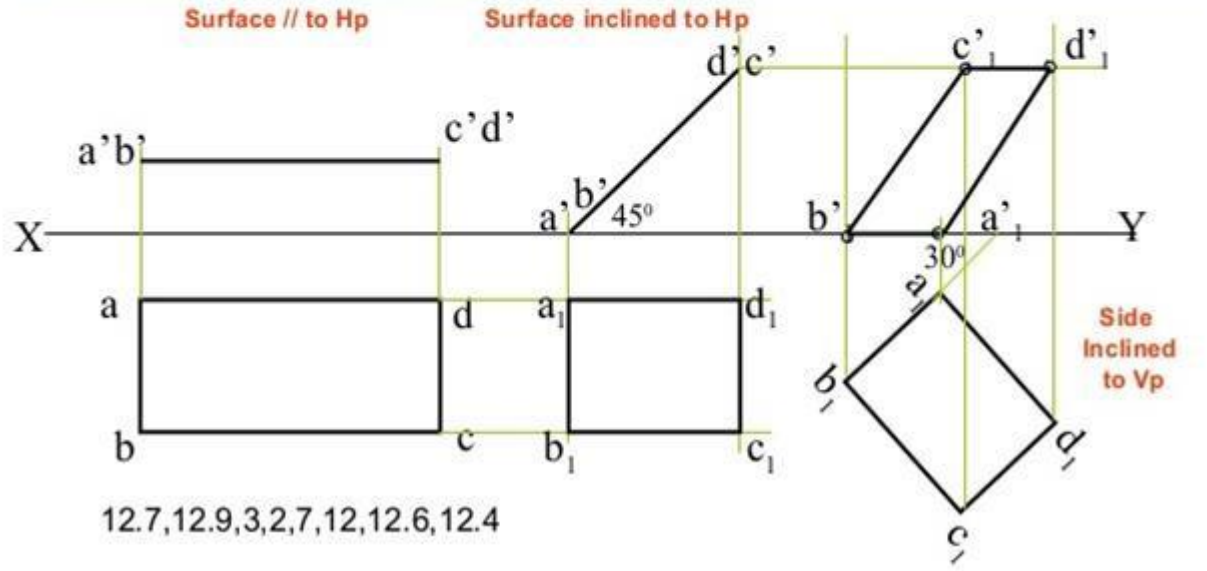
Hint: As the plane is inclined to HP, it should be kept parallel to HP with one edge perpendicular to VP



Problem 1:
Rectangle 30mm and 50mm sides is resting on HP on one small side which is 30° inclined to VP,while the surface of the plane makes 45° inclination with HP. Draw it's projections.

Read problem and answer following questions
1. Surface inclined to which plane? _____
2. Assumption for initial position? _____
3. So which view will show True shape? _____
4. Which side will be vertical? _____.

Hence begin with __, draw rectangle _____ XY drawing one small side vertical.



UNSOLVED PROBLEMS

1. A square having 50 mm side makes an angle of 45° with the HP. Draw its projections
2. A rectangular surface having sides 40 mm and 30 mm makes an angle of 30° with HP and 45° with VP . Draw its projections
3. A circular plate of 60 mm diameter situated 50 mm in front of VP and parallel to VP. Draw itsprojections.

Experiment Number -4

AIM: To prepare a sheet of the projections of given solids as per description.

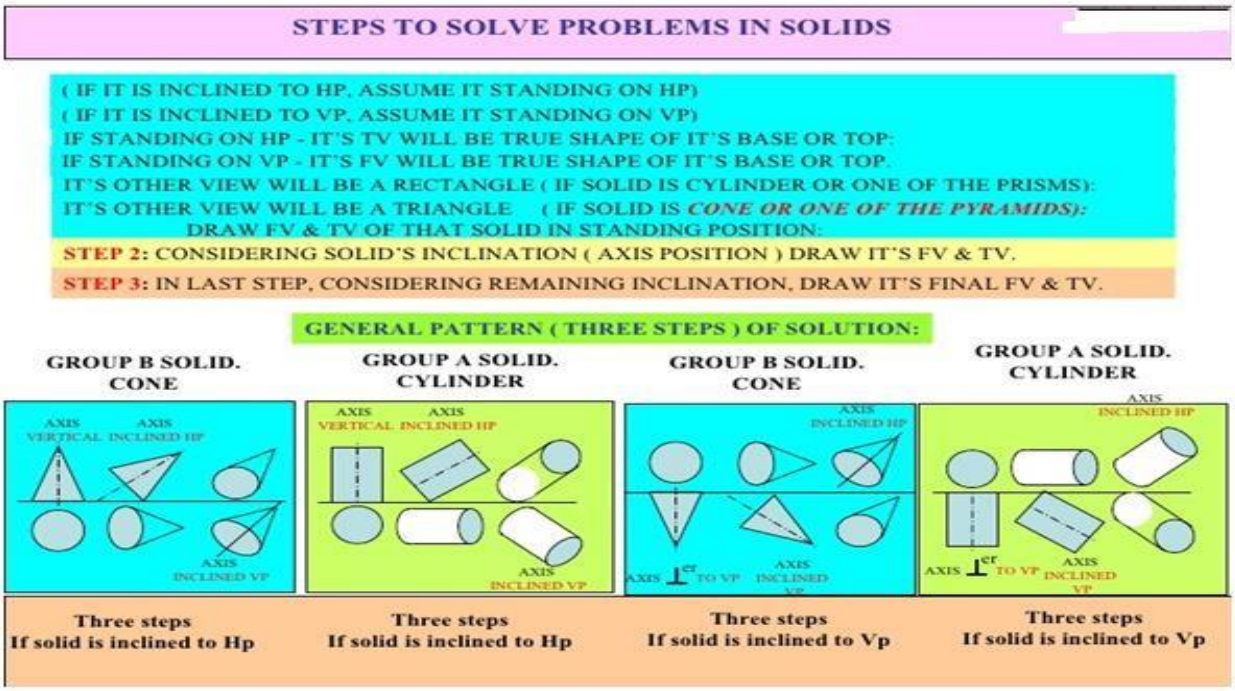
APPARATUS USED: Drawing sheets, Complete Engineering Drawing Box, Mini Drafter, clips.

THEORY:

SOLIDS: An object having three dimensions, i.e., length, breadth and height is called a solid.

PROJECTIONS OF SOLID: The shadow of a solid obtained on HP and VP is known as projection ofsolid**.**

TYPE OF SOLIDS: a) Polyhedral b) Solids of revolution



POLYHEDRAL: The solid which is bounded by plane surfaces is called a polyhedral.

- Tetrahedron Cube

PRISM: The polyhedral having two equal and similar ends bases, parallel to each other and are joined by other faces which may be rectangle or parallelograms is called a prism.

a) Square b) Pentagonal c) Hexagonal

- **PYRAMID:** the polyhedral having a plane figure for its base and equal number of isoscelestriangular faces meeting at a point is called as pyramid.

a) Square b) Pentagonal c) Hexagonal

UNSOLVED QUESTIONS

1.A right circular cone of height 60 mm and base diameter 50 mm is place on its base on HP. Drawthe projections when the its axis makes an angle of 45^{o} with HP.

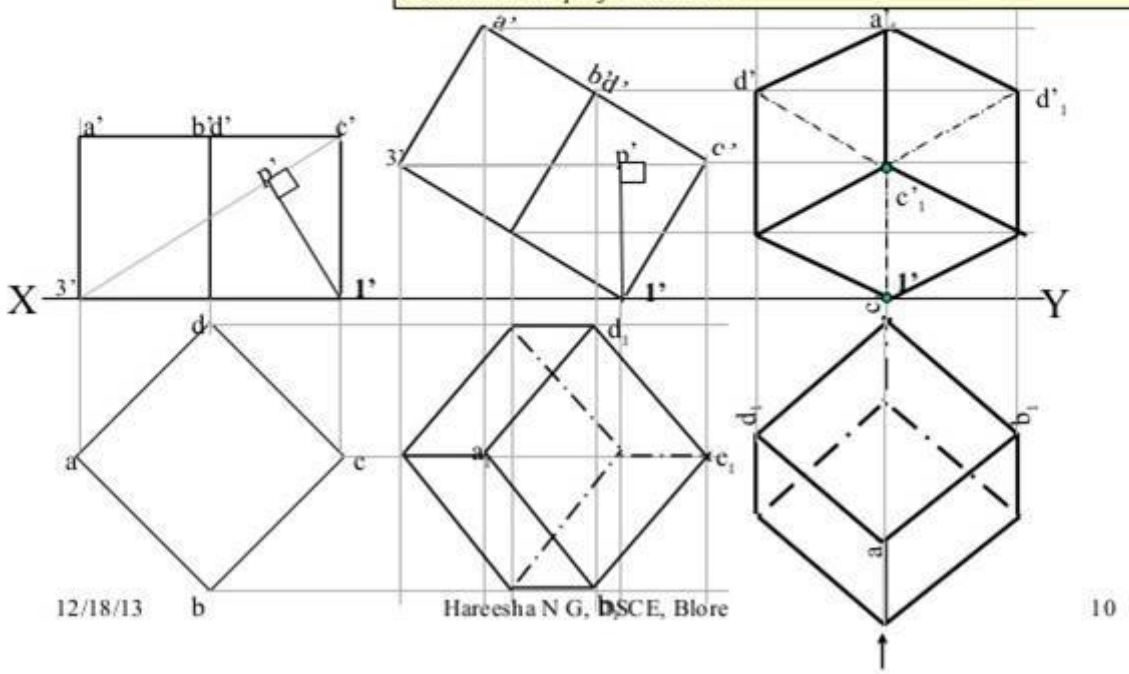
2. A cylinder having 50 mm diameter and 70 mm height is placed with its diameter perpendicularto HP. The axis of the cylinder makes an angle of 45^{o} with the HP. Draw its projections.

3. A right circular cone is as in question 1 is placed on HP on its surface. Draw its projections whenthe axis of the cone makes an angle of 45^{o} with the VP.

Problem A cube of 50 mm long edges is so placed on Hp on one corner that a body diagonal is parallel to Hp and perpendicular to Vp Draw it's projections.

Solution Steps:

1.Assuming standing on Hp, begin with Tv,a square with all sides equally inclined to xy.Project Fv and name all points of FV & TV.
2.Draw a body-diagonal joining c' with 3'(This can become // to xy)
3.From 1' drop a perpendicular on this and name it p'
4.Draw 2nd Fv in which 1'-p' line is vertical ***means*** c'-3' diagonal must be horizontal. .Now as usual project Tv..
6.In final Tv draw same diagonal is perpendicular to Vp as said in problem. Then as usual project final FV.



Experiment Number - 5

AIM: To prepare a sheet of the projections of Section of solids as per description.

APPARATUS USED: Drawing sheets, Complete Engineering Drawing Box, Mini Drafter, clips.

THEORY: Sections of Solids Sections and sectional views are used to show hidden detail more clearly. They-are created by using a cutting plane to cut the object.
A section is a view of no thickness and shows the outline of the object at the cutting plane. Visible outlines beyond the cutting plane are not drawn.

A sectional view, displays the outline of the cutting plane and all visible outlines which can be seen beyond the cutting plane**.** Improve visualization of interior features. Section views are used when important hidden details are in the interior of an object. These details appear as hidden lines in one of the orthographic principal views; therefore, their shapes are not very well described by pure orthographic projection.
Types of Section Views
• Full sections
• Half sections
• Offset sections
• Revolved sections
• Removed sections
• Broken-out sections

Cutting Plane : Section views show how an object would look if a cutting plane (or saw) cut through the object and the material in front of the cutting plane was discarded.

Representation of cutting plane
According to drawing standards cutting plane is represented by chain line with alternate long dash and dot. The two ends of the line should be thick.

Full Section View
• In a full section view, the cutting plane cuts across the entire object
• Note that hidden lines become visible in a section view

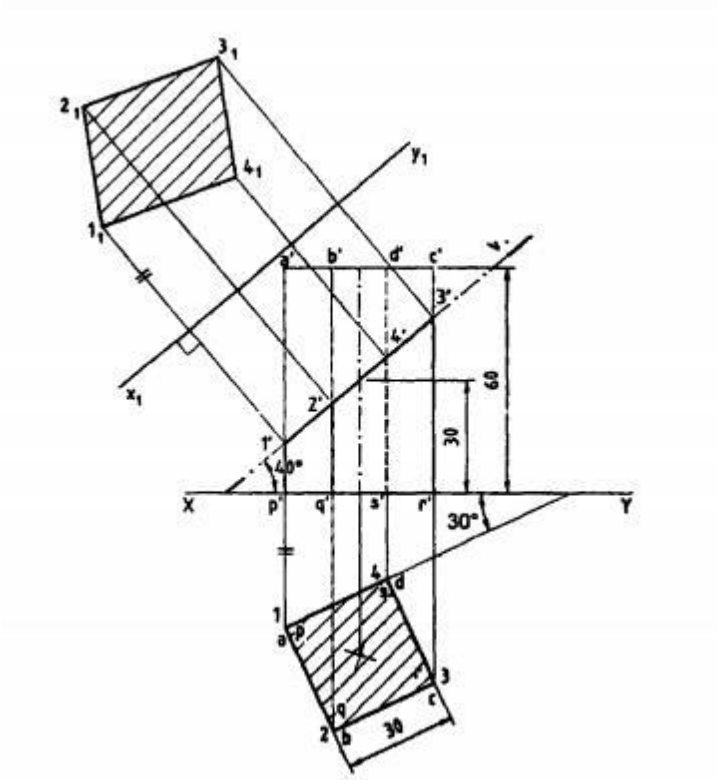
Hatching: On sections and sectional views solid area should be hatched to indicate this fact. Hatching is drawn with a thin continuous line, equally spaced (preferably about 4mm apart, though never less than 1 mm) and preferably at an angle of 45 degrees.

Problem 1 : A square prism of base side on 30 mm and axis length 60 mm is resting on HP on one of its bases, with a base side inclined at 30° to VP. It is cut by a plane .inclined at 40° to. HP and perpendicular to VP and is bisecting the axis of the prism. Draw its front view, sectional top view and true shape of section.

Solution : Draw the projections of the prism in the given position. The top view is drawn and the front view is projected.

To draw the cutting plane, front view and sectional top view

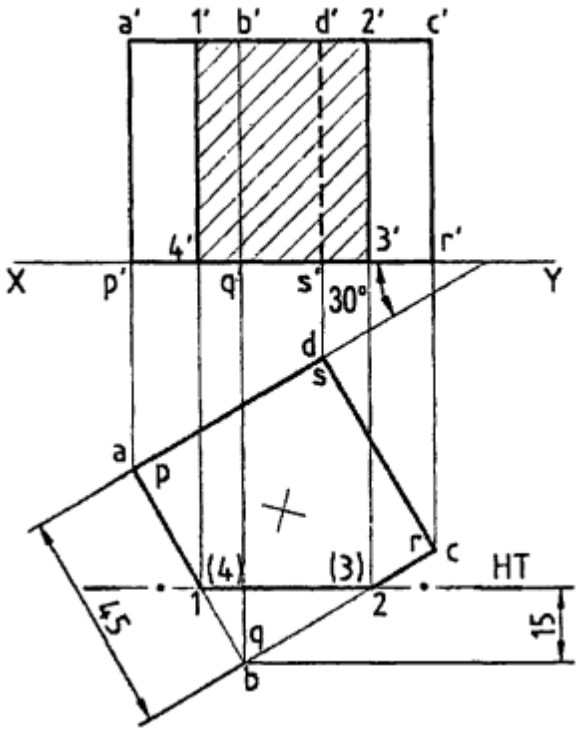
1. Draw the Vertical Trace (*VT)* of the cutting plane inclined at 40° to *XY* line and passing through the mid point of the axis.
2. As a result of cutting, longer edge a' p' is cut, the end a' has been removed and the new corner l' is obtained.
3. Similarly 2' is obtained on longer edge b' q', 3' on c' r' and 4' on d' s',
4. Show the remaining portion in front view by drawing dark lines.
5. Project the new points 1', 2', 3' and 4' to. get 1, 2, 3 and 4 in the top view of the prism, which are coinciding with the bottom end of the longer edges p, q, r and s respectively.
6. Show the sectional top view or apparent section by joining 1, 2, 3 and 4 by drawing hatching lines.



Problems 2 : A cube of 4S mm side rests with a face on HP such that one of its vertical faces is inclined at 30° to VP. A section plane, parallel to VP cuts the cube at a distance of 1 S mm from the vertical edge nearer to the observer. Draw its top and sectional front view.

Solution:

1. Draw the projections of the cube and the Horizontal Trace (HT) of the cutting plane parallel to XY and 15 mm from the vertical edge nearer to the observer.
2. Mark the new points 1,2 in the top face edge as ab and be and similarly, 3, 4 in the bottom face edge as qr and pq which are invisible in top view.
3. Project these new points to the front view to get 1', 2 '. in top face and 3' , 4' in. bottom face.
4. Join them and draw hatching lines to show the sectional front view which also shows the true shape of section .



Experiment Number -6

AIM: To prepare a sheet of development of lateral surface

APPARATUS USED: Drawing sheets, Complete Engineering Drawing Box, Mini Drafter, clips.

THEORY:

DEVELOPMENT OF SURFACES: The complete surface of an object when laid out on a plane is called the development of the surface or pattern of the object.

ENGINEERING APPLICATIONS OF DLS:

The engineering applications of development is generally employed in sheet metal works, in the construction of boilers, pattern making, stone cutting, tunnels, buckets, chimney, prisms, cylinder, pyramids, cones, spheres, etc .

METHODS OF DEVELOPMENT

PARALLEL-LINE DEVELOPMENT**: -** It is used for developing prisms and single curved surfaces like cylinders in which all the edges/generators of lateral surfaces are parallel to each other.

RADIAL-LINE DEVELOPMENT**:-**It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator (which are the true lengths) as radius for its development.

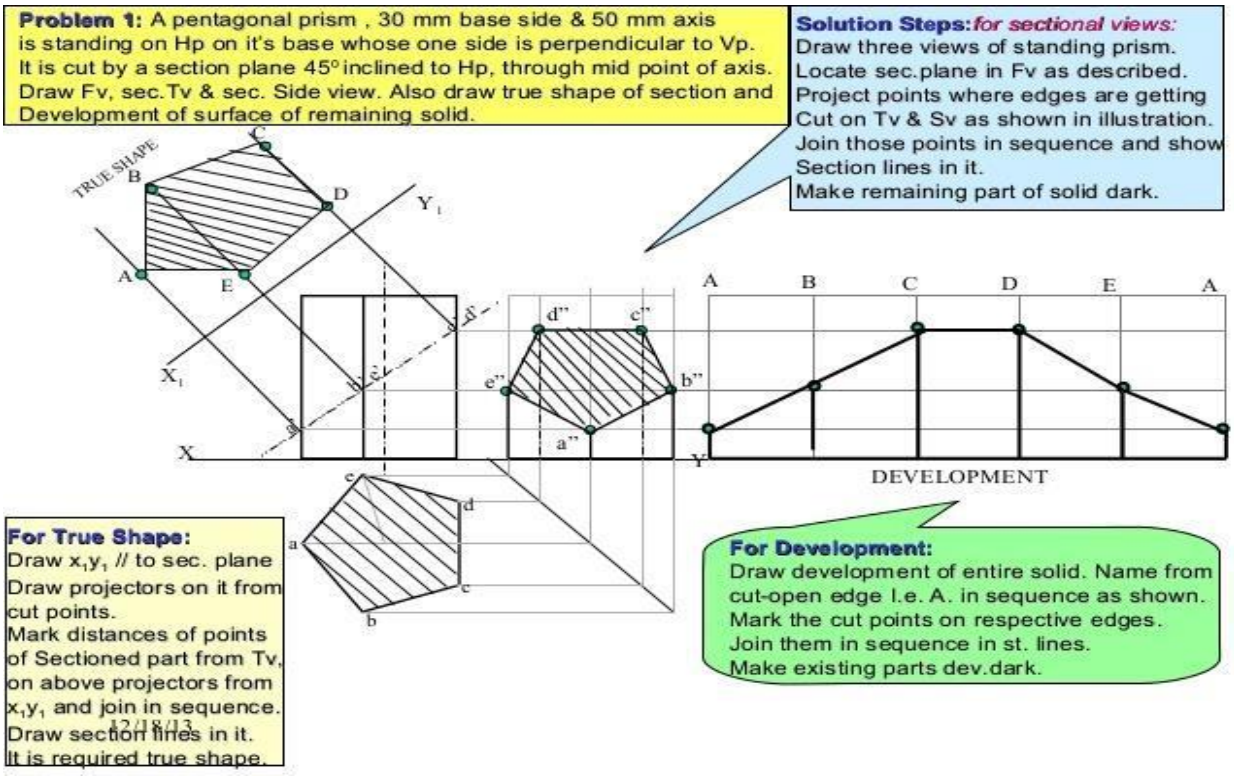
PROCEDURE:

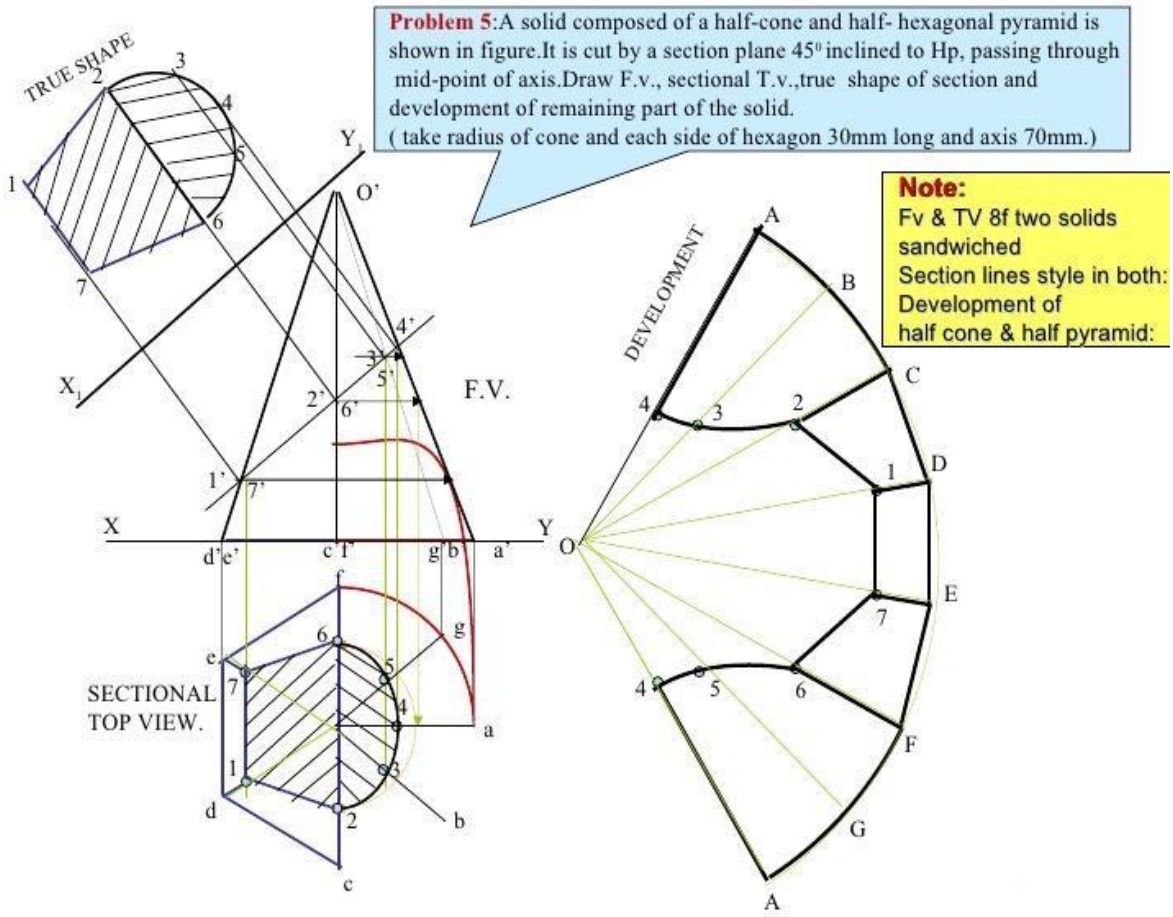
1. Draw reference line XY.
2. Draw FV and TV of a solid as per given data.
3. Draw the section plane (line) parallel to XY as per given data.
4. Draw projection line from the intersection point of the section line and object edge.
5. Draw the development of the solid.

6. Draw the projection line from the intersection point of the edges and section line to the corresponding edges of the developed surface.

7. Name to the corner points of the solid in front view and top view and the developed surface.

8. Show all necessary dimensions




Problem 5:A solid composed of a half-cone and half- hexagonal pyramid is shown in figure.It is cut by a section plane 45° inclined to Hp, passing through mid-point of axis.Draw F.v., sectional T.v.,true shape of section and development of remaining part of the solid.
(take radius of cone and each side of hexagon 30mm long and axis 70mm.)
Note:
Fv & TV 8f two solids sandwiched
Section lines style in both:
Development of half cone & half pyramid:
TRUE SHAPE
F.V.
SECTIONAL TOP VIEW.
DEVELOPMENT
X
Y
O'
A
B
C
D
E
F
G

Experiment Number -7

AIM: To prepare a sheet of isometric projections of given solid.

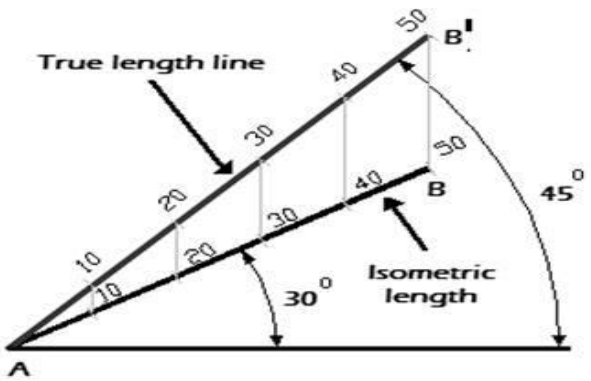
APPARATUS USED: - Drawing sheets, Complete Engineering Drawing Box, Mini Drafter,clips.

THEORY: The isometric projection of an object is a one plane view drawn with the object so placed with respect to the plane of projection that all the three principal axes appear to be inclined to each other at an equal angle of 12.

ISOMETRIC SCALE: The isometric scale is used to measure the foreshortened length of dimensions of any object to draw the isometric projection. The steps of construction of isometric scale are given below

- Draw a horizontal line PQ.
- Draw the true lengths on a line AB1 inclined at 45° to the horizontal line (say up to 70 mm
- Draw another line BA at 30° to the horizontal line.
- Draw the vertical projection of all the points of true length from AB1 to BA.
- Complete the scale with the details as shown in the figure.

The lengths shown at the line BA are the isometric lengths to be used to draw the isometricprojection.



PROCEDURE:

- Draw the base of the solid "with isometric scale" as per specified condition with respect to V.P. and H.P. as per the rules of orthographic projection. It is called Helping Figure.

- Draw the centre of the helping figure and enclose the helping figure in a suitable rectangle. Transfer the co-ordinates of centre to the sides of the enclosing rectangle with centre lines.

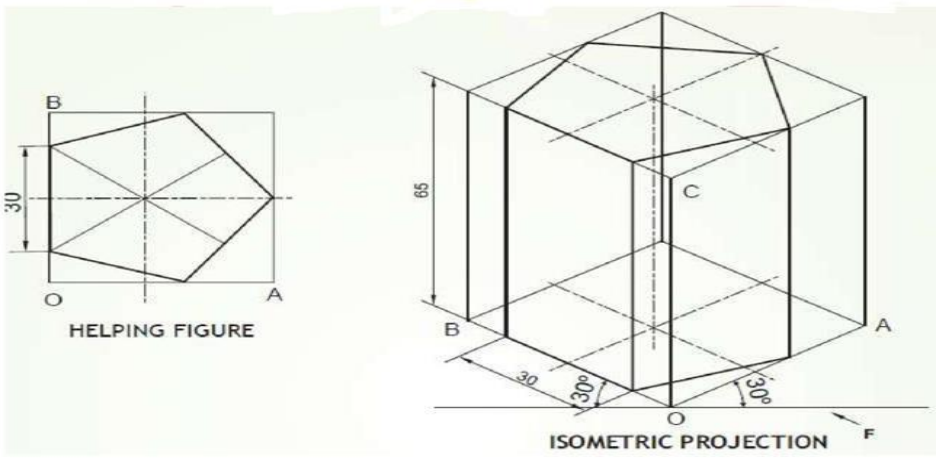
- Draw the three principal axes at 30°, 90° and 30° to the horizontal base line.

- Copy the length of sides of helping figure's rectangle on the respective principal axis and the height or length of the object on the third principal axis. It will give a box in which the object will be perfectly/snugly fitted.

- Copy the co-ordinates of centre and the vertices of the base on this box.

- Join the visible edges by thick lines and Axis line by the centre line.

- Complete the isometric projection with dimensioning and direction of viewing. Now let us draw the isometric projection of regular solids.

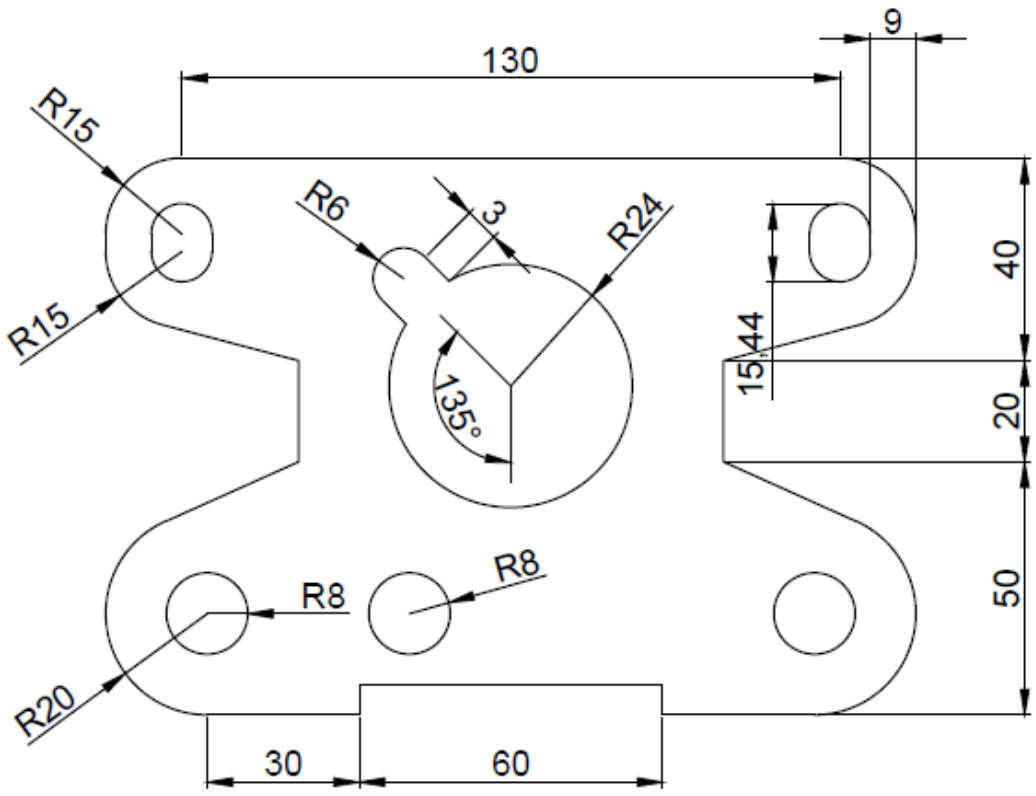


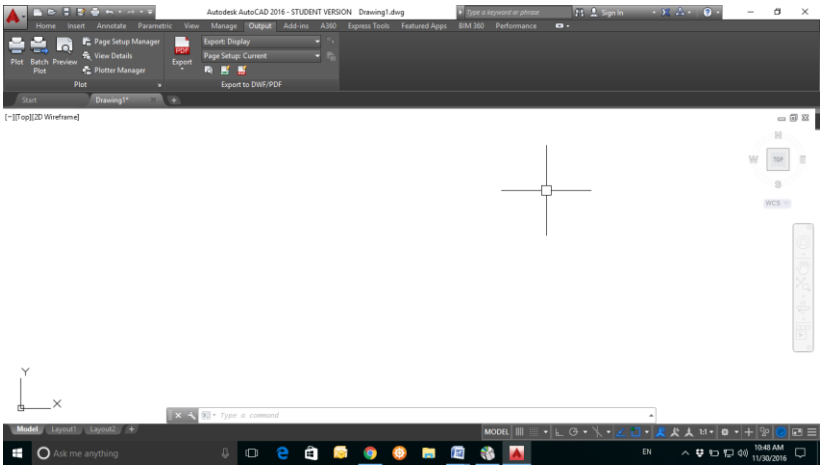
Experiment Number -8

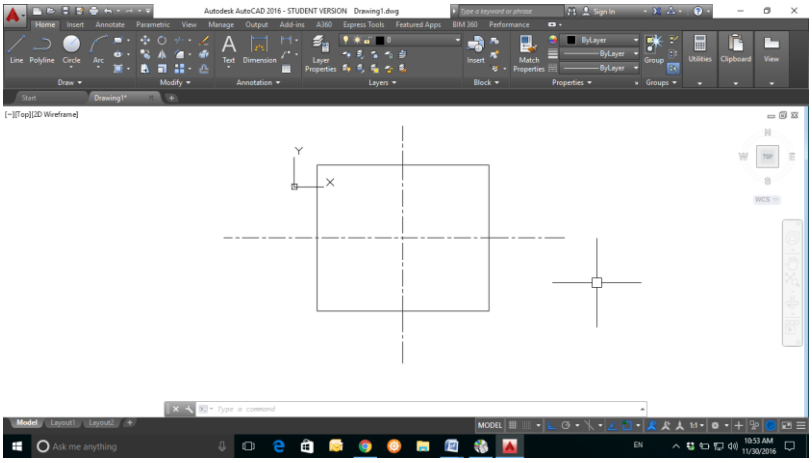
AIM: To prepare an AUTOCAD drawing.

APPARATUS USED: Auto Cad software, desktop with 4 GB RAM.

THEORY: AUTOCAD is a tool which is widely used in engineering field. AUTOCAD can be used for drafting purposes and modeling purposes. Many basic entities can be drawn on this software using either command prompt or mouse. Many tutorials are available in the help file which is user friendly, hence AUTOCAD is said to be user friendly software**.**




Autodesk AutoCAD 2016 - STUDENT VERSION Drawing1.dwg
[-][Top][2D Wireframe]
Model
Layout1
Layout2
MODEL


Autodesk AutoCAD 2016 - STUDENT VERSION Drawing1.dwg
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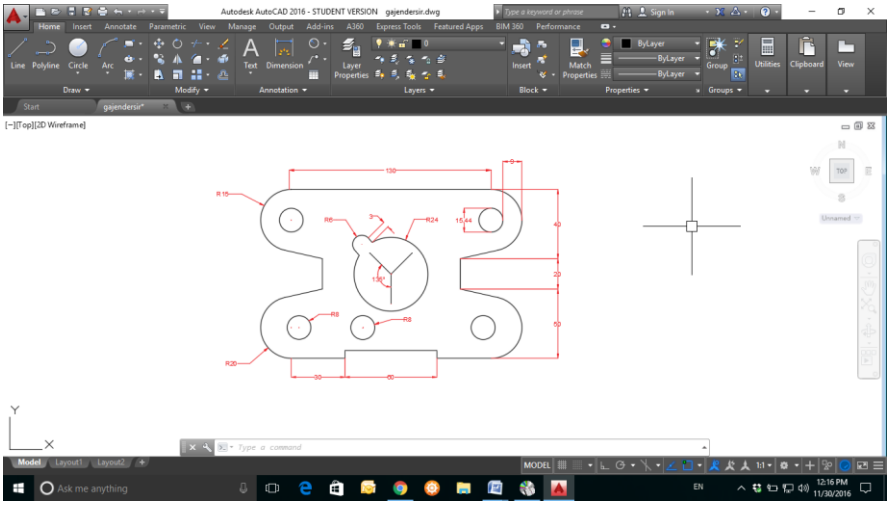
Model
Layout1
Layout2
MODEL



This lab Manual has been updated by

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Crosschecked by HOD APS

Verified By

Director,DGI Greater Noida

Please spare some time to provide your valuable feedback.