INSTITUTE OF MECHANICAL ENGINEERING

MEA01
ENGINEERING GRAPHICS

LABORATORY MANUAL

Register Number: _____   **Year:** _____

Student Name: _____

Department: _____

Faculty Name: _____
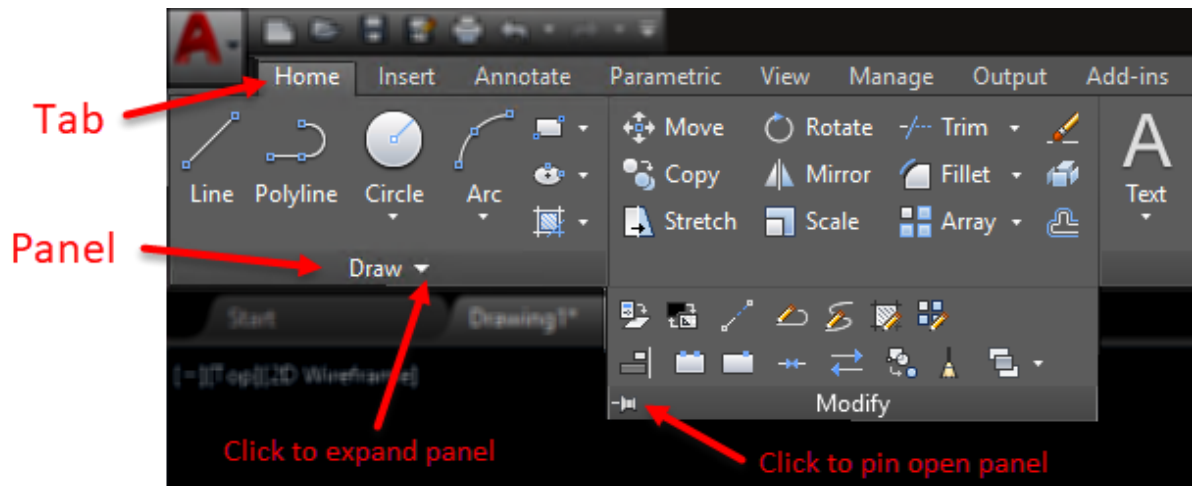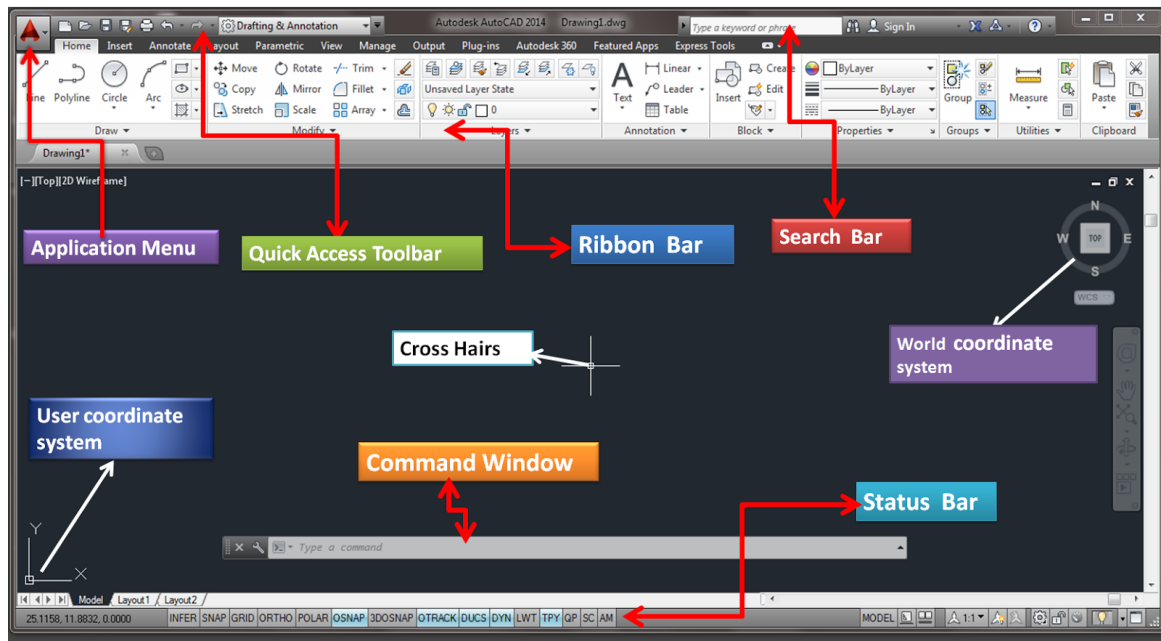
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INTRODUCTION TO AUTOCAD

Computer Aided Design and Drafting (CADD) is a powerful technique to create the drawings. Traditionally, the components and assemblies are represented in drawings with the help of elevation, plan, and end views and cross sectional views. In early stages of development of CADD, several software packages were developed to create such drawings using computers. Since any entity in this type of representation only two co-ordinates, such software packages were called 2-D drafting packages. With the evolution of CADD, most of these packages have been upgraded to enable 3-D representation. However, 2-D representation is still a standard way of representing components.

Hardware for Drafting Packages

Drafting packages are generally PC based though some of them can run on workstations in Windows environment. PIV PC with 512MB RAM; 20GB hard disc and CD ROM, mouse and a suitable plotter are the minimum requirements of a drafting environment. Either VGA or SVGA monitors are recommended. Nowadays, many users prefer to work in windows environment. It is convenient and productive to work in a networked system if a number of designers and draftsmen use a CAD package for design and drafting.
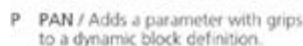
Features of a Drafting Package

1. Drawing utilities: This includes selection of units, screen limits, scale, snap etc.
2. Entity drawing: Several standard entities like line, circle, arc, polyline, polygon etc are available to create the model required.
3. Edit commands: A number of commands are available to modify or copy or replicate the entities or groups of entities in a model.
4. Standard parts: Facilities are available to create symbols, shapes and other standard parts. Frequently used parts can be stored as blocks which can be inserted into a drawing as and when required.
5. Display: The model can be enlarged, reduced in size, or moved across the screen, using display or view commands.
6. Cross hatching: Sectional plans can be indicated through cross hatching.
7. Dimensioning: Parts can be dimensioned using a number of standard dimensioning systems.
8. Plotting: Facilities to get hard copies of drawings using a pen or electrostatic plotter.
9. Configuration: Software has to be configured to given hardware environment.
10. Customization: Drafting productivity can be enhanced through customizing software packages.
11. Drawing interchange: It may be necessary to import or export drawing files created in one software package to another.

Application Menu | Quick Access Toolbar | Ribbon Bar | Search Bar

Cross Hairs | World coordinate system | User coordinate system | Command Window | Status Bar

Tab | Panel | Click to expand panel | Click to pin open panel

Drawing Utilities

Drawing utilities include several functions to help the creation and storage of drawings. These are discussed below:

- Screen size: Generally, the screen is given a default size but the size can be re-fixed as per the requirements. This facility is available in all software because various sizes of drawings and figures will have to be created. Assembly drawings may require larger sizes whereas part drawings require only smaller sizes. When the command for fixing the drawing limit is invoked the values of the co-ordinates of the bottom left corner and the top right corner are specified as the answer to the queries. Alternatively, the size of the drawing sheet can be specified. Automatically the software re-fixes the size of the screen.

- Scaling: It may be necessary to fit a large size drawing within a smaller drawing sheet size. The dimensions can be automatically scaled for this purpose.

- Grid: A grid facility is provided by the software to help the draftsman to estimate the distances on the screen. A grid is a matrix of points on the screen whose intervals can be chosen on the screen as required.

- Snap: The drawing is created with the help of a cursor. The smallest movement of the cursor is one pixel. The cursor can be moved through a distance using SNAP feature. The snap mode can be switched ON or OFF as desired.

- Units: Different types of units are used for different applications. For example, metric units and inch units. The dimension format can be scientific, decimal, engineering, architectural or fractional. Angles can be specified in decimal degrees, degree/minute/seconds or radians.

- Specifying points: A point can be specified using the following formats:
  - Cartesian co-ordinates
  - Polar co-ordinates
  - Spherical co-ordinates
  - Cylindrical co-ordinates
  - Relative co-ordinates

- Line types, Text formats and Shapes: In a drawing several types of lines will be used and these types are already available and are given some designation by the software. The default will be the generally used line type but as per the requirements the line type can be chosen before any line is drawn.

- Saving a Drawing: After a drawing is created it is saved with a file name. The drawing file has a .DWG extension

Keyboard layout with labels above keys:

- F1 — Display Help
- F2 — Toggle text screen
- F3 — Toggle object snap mode
- F4 — Toggle 3DOsnap
- F5 — Toggle Isoplane
- F6 — Toggle Dynamic UCS
- F7 — Toggle grid mode
- F8 — Toggle ortho mode
- F9 — Toggle snap mode
- F10 — Toggle polar mode
- F11 — Toggle object snap tracking
- F12 — Toggle dynamic Input mode

Key row: Esc F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 PrtScn SysRq ScrLK Pause Break

Number row: ~ ` ! 1 @ 2 # 3 $ 4 % 5 ^ 6 & 7 * 8 (9) 0 — - + = Backspace Home End

QWERTY row: Tab Q QSAVE W WBLOCK E ERASE R REDRAW T MTEXT Y U I INSERT O OFFSET P PAN {[}] |\ Insert Page Up

Home row: Caps Lock A ARC S STRETCH D DIMSTYLE F FILLET G GROUP H HATCH J JOIN K L LINE : ; " ' Enter Delete Page Down

Bottom row: Shift Z ZOOM X EXPLODE C CIRCLE V VIEW B BLOCK N M MOVE < , > . ? / Shift ▲

Ctrl Start Alt (space) Alt Ctrl ◄ ▼ ►

Q QSAVE / Saves the current drawing.

A ARC / Creates an arc.

Z ZOOM / Increases or decreases the magnification of the view in the current viewport.

W WBLOCK / Writes objects or a block to a new drawing file.

S STRETCH / Stretches objects crossed by a selection window or polygon.

X EXPLODE / Breaks a compound object into its component objects.

E ERASE / Removes objects from a drawing.

D DIMSTYLE / Creates and modifies dimension styles.

C CIRCLE / Creates a circle.

R REDRAW / Refreshes the display in the current viewport.

F FILLET / Rounds and fillets the edges of objects.

V VIEW / Saves and restores named views, camera views, layout views, and preset views.

T MTEXT / Creates a multiline text object.

G GROUP / Creates and manages saved sets of objects called groups.

B BLOCK / Creates a block definition from selected objects.

H HATCH / Fills an enclosed area or selected objects with a hatch pattern, solid fill, or gradient fill.

J JOIN / Joins similar objects to form a single, unbroken object.

M MOVE / Moves objects a specified distance in a specified direction.

I INSERT / Inserts a block or drawing into the current drawing.

O OFFSET / Creates concentric circles, parallel lines, and parallel curves.

L LINE / Creates straight line segments.

P PAN / Adds a parameter with grips to a dynamic block definition.

Edit Commands

It is necessary to make alterations to the entities of a drawing. EDIT commands are used for this purpose. A list of edit commands and their functions are given below:

- ➤ ERASE   Erase a single entity or a group of entities.
- ➤ OOPS   Retrieve objects erased inadvertently.
- ➤ MOVE   Move objects to a new location.
- ➤ ARRAY   Make multiple copies of an object.
- ➤ CHANGE   Changes the properties of the object.
- ➤ BREAK   Break an existing object into pieces.
- ➤ MIRROR   Create mirror images of existing objects
- ➤ EXPLODE   Explode a polyline into its component entities.
- ➤ ROTATE   Rotate an existing object through a specified angle
- ➤ CHAMFER   Chamfer corners of objects.
- ➤ FILLET   Provide radius on corners of objects.
- ➤ STRETCH   Move parts by stretching the objects connected to it.
- ➤ OFFSET   To draw parallel lines or curves.
- ➤ UNDO   Undo a specified number of commands.
- ➤ TRIM   Trim portions of entities.

Dimensioning

Dimensioning and adding annotations are very important in any drawing. If the dimension of any object could be drawn just by pointing the object, it will be the best facility. Such a feature is known as automatic dimensioning, particularly if the dimensions are drawn in various views of the object. The features of the object in the various views of the object are not related at all and they are treated as separate objects, by the software and so dimensioning has to done in different views separately.

Display/View

Display/view commands are useful to manipulate the drawings on the screen. A frequently used display command is ZOOM. A drawing or parts of a drawing usually picked by a window options can be scaled up as required by zoom command. This makes it possible to draw minute details accurately as well as to view the drawings in detail. In the case of large drawing, parts of the drawings may be out of the screen. In order to view such hidden portion, the PAN command is used. The command causes the drawing to move across the screen. There are commands to generate orthographic, isometric, perspective and axonometric projections. Dynamic viewing is also available in many packages.

AutoCAD Application Areas

1. Architecture
2. Civil Engineering
3. Interior Designing
4. Automobile Industry
5. Aerospace Industry
6. Mechanical Engineering
7. Fashion Designing
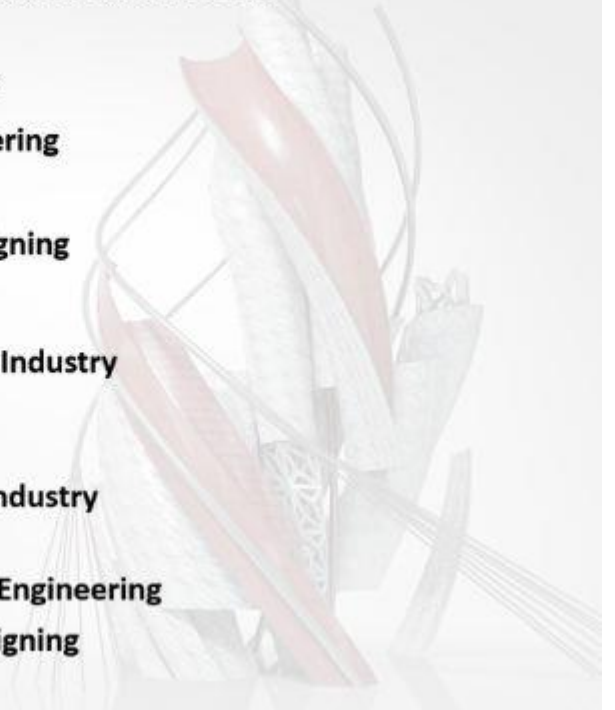
Advantages of using CAD

1. Construction of quality drawings.
2. Creation of data base.
3. Creation of library.
4. Use of layers.
5. Saving on repetition.
6. High accuracy.
7. Editing the drawings.
8. Time saving.

APPLICATIONS OF CAD

AutoCAD software is the most comprehensive mechanical product design & drafting software that caters to various needs of the mechanical engineering companies, It comes with a complete set of powerful drafting and detailing tools for drafting the professionals. There is virtually no limit to the kinds of line drawings using AutoCAD. If a drawing can be created by hand, it can be generated by AutoCAD. Here are a few of the applications of the AutoCAD:

- ✓ Architectural drawing of all kinds
- ✓ Interior design and facility planning
- ✓ Work-flow charts and organizational diagrams
- ✓ Proposals and presentations
- ✓ Graphs of all kinds
- ✓ Drawings for electronic, chemical, civil, mechanical, automotive and aerospace engineering applications
- ✓ Topographic maps and nautical charts
- ✓ Yacht design
- ✓ Plots and other representations of mathematical and scientific functions
- ✓ Theatre set-lighting designs
- ✓ Musical scores
- ✓ Technical illustrations and assembly diagrams
- ✓ Company logos
- ✓ Greeting cards
- ✓ Line drawings for the fine art

****

Expt: 1

Figure 1.1

Figure 1.2

Expt: 1   **Date:**

DRAWING OF TITLE BLOCK

Aim:

  To draw the Title Block with necessary texts and Projection Symbol using AutoCAD.

System and Software:

  System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

  Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet(for A4 sheet set the Limits(0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: dimlinear**
   This command creates linear dimensions.
4. **Command: mtext**
   This command creates multiline text.
5. **Command: offset**
   This command creates concentric circles, parallel lines and parallel curves.
6. **Command: regen**
   This command regenerates the drawings and refreshes the current view port.
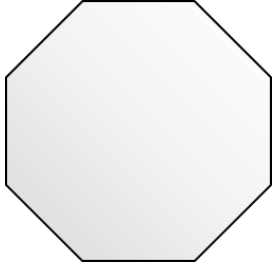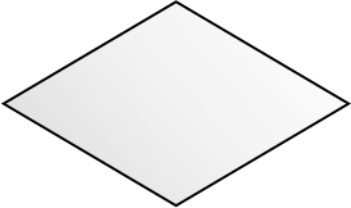7. **Command: ddedit**
   This command edits the text.
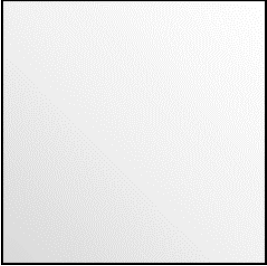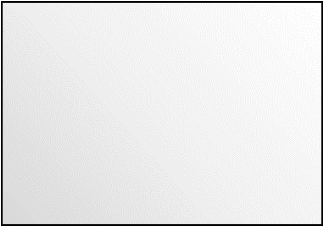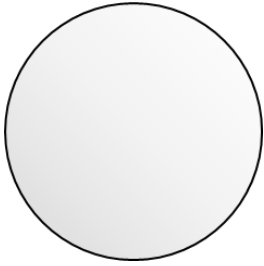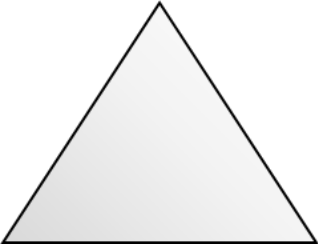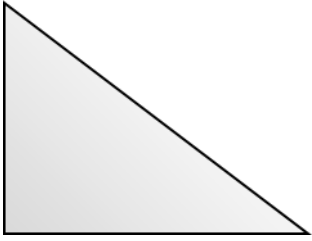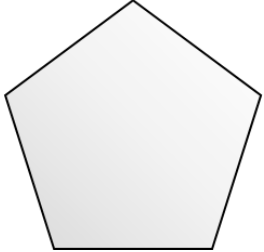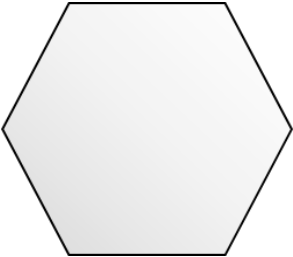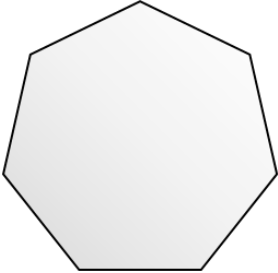
Expt: 1 OUTPUT

- ❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.
- ❖ Draw the border lines for the title block using the LINE command.
- ❖ Further partition the block into smaller cells as shown in the diagram using LINE command and OFFSET command.
- ❖ Enter relevant texts in the cells using the MTEXT command.
- ❖ Draw the projection symbol using LINE and CIRCLE commands. Place them in the corresponding cell using the MOVE command.
- ❖ Show the dimensions of the title block elements using the DIMLINEAR command.
- ❖ Save the file in the drive as .dwg format.

Result:

The title block layout for Engineering drawing were constructed in AutoCAD as per the standards.

Expt: 2

Square Side length = 50 mm	**Rectangle** Length = 80mm Width = 50mm	**Circle** Radius = 25 mm
Equilateral Triangle Side length = 50 mm	**Right angled Triangle** Base = 80 mm Height = 50 mm	**Pentagon** Side length = 30 mm
Hexagon Side length = 30 mm	**Heptagon** Side length = 30 mm	**Octagon** Side length = 30 mm
Parallelogram Length = 80 mm Height 50 mm Skew angle = 60°	**Trapezium** Base = 80 mm Top = 60 mm Height = 50 mm	**Rhombus** Diagonal 1 = 60 mm Diagonal 2 = 40 mm

Expt: 2   **Date:**

DRAWING OF BASIC GEOMETRICAL SHAPES

Aim:

To create the basic geometrical shapes of given dimensions in AutoCAD.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet(for A4 sheet set the Limits(0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: dimlinear**
   This command creates linear dimensions.
4. **Command: mtext**
   This command creates multiline text.
5. **Command: offset**
   This command creates concentric circles, parallel lines and parallel curves.
6. **Command: circle**
   This command creates circles in the drawing.
7. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
8. **Command: fillet**
   This command rounds and fillets the edges of objects.

Expt: 2 OUTPUT

- ❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.
- ❖ Draw the border lines for the sheet using the LINE command.
- ❖ Draw the given figures in the required dimensions.
- ❖ Cut and trim excess line segments using the TRIM command.
- ❖ Use MIRROR command to develop symmetrical features in the figure.
- ❖ Show the dimensions of the figures using the DIMLINEAR command.
- ❖ Save the file in the drive as .dwg format.

Result:

Thus the given basic geometric shapes were drawn using the standard AutoCAD 2016 software.
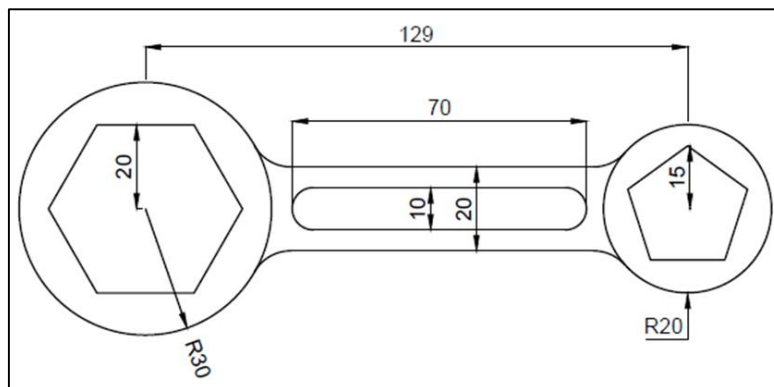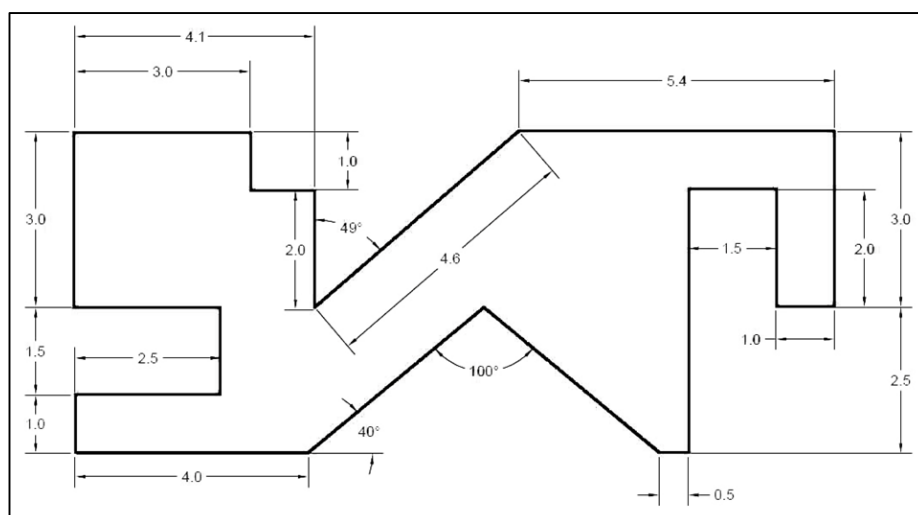
Expt: 3
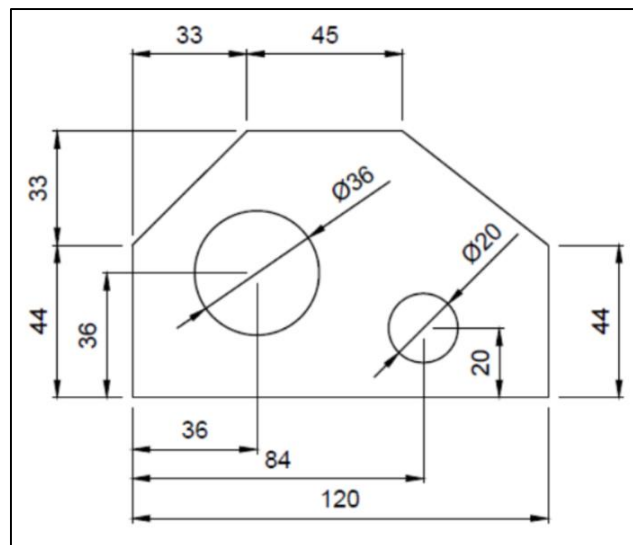
Figure 3.1

Figure 3.2

Figure 3.3

Expt: 3   **Date:**

<p align="center">**DRAWING OF SIMPLE MULTI-LINE FIGURES**</p>

Aim:

To create 2D models of the given Multi-line figures in AutoCAD.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet(for A4 sheet set the Limits(0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: dimlinear**
   This command creates linear dimensions.
4. **Command: mtext**
   This command creates multiline text.
5. **Command: offset**
   This command creates concentric circles, parallel lines and parallel curves.
6. **Command: circle**
   This command creates circles in the drawing.
7. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
8. **Command: fillet**
   This command rounds and fillets the edges of objects.

Expt: 3 OUTPUT

❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.
❖ Draw the border lines for the sheet using the LINE command.
❖ Draw the given figures in the required dimensions.
❖ Cut and trim excess line segments using the TRIM command.
❖ Use MIRROR command to develop symmetrical features in the figure.
❖ Show the dimensions of the figures using the DIMLINEAR command.
❖ Save the file in the drive as .dwg format.

Result:

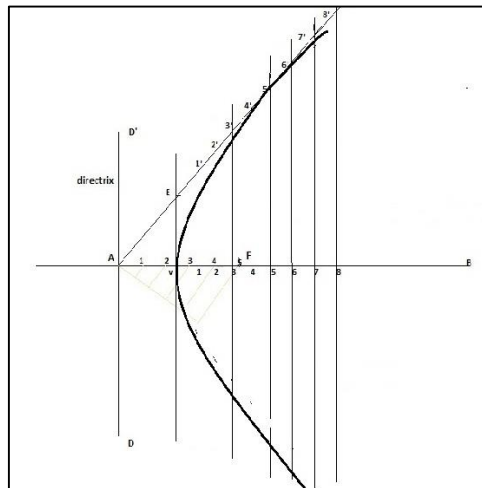Thus the given simple Multi-line figures were drawn using the standard AutoCAD 2016 software.
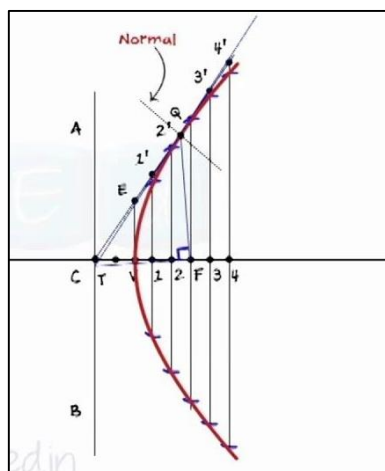
Expt: 4

4.1 Construct an ellipse when the distance of the focus from the directrix is 50 mm & e= 2/3.
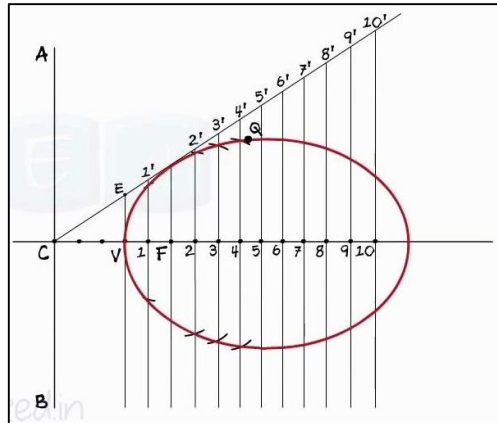
4.2 Construct a parabola when the distance between focus and the directrix is 50 mm.

4.3 Construct a hyperbola when the distance between focus and the directrix is 50 mm & e = 3/2.

Expt: 4   **Date:**

CONSTRUCTION OF CONIC CURVES

Aim:

To construct the conic curves – ellipse, parabola, and hyperbola using the given specifications in AutoCAD.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure

1. **Command: limits**
   This command sets the screen to the required drawing sheet(for A4 sheet set the Limits(0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: dimlinear**
   This command creates linear dimensions.
4. **Command: mtext**
   This command creates multiline text.
5. **Command: offset**
   This command creates concentric circles, parallel lines and parallel curves.
6. **Command: spline**
   This command creates custom spline curves in the drawing.
7. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
8. **Command: pattern**
   This command creates several copies of the selected elements with regular spacing.

Expt: 4 OUTPUT

❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.

❖ Draw the border lines for the drawing using the LINE command.

❖ Use the offset or pattern command to make multiple regular spaced construction lines for the drawing of conic curve.

❖ Use SPLINE tool to draw the final conic curve after the preparation is completed.

❖ Enter relevant texts in the cells using the MTEXT command.

❖ Show the dimensions using the DIMLINEAR command.

❖ Save the file in the drive as .dwg format.

Result:

Thus the conic curves were constructed by using the standard CAD software – AutoCAD 2016.
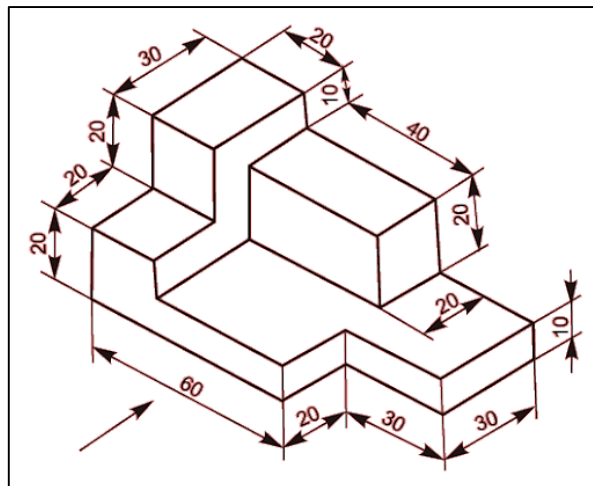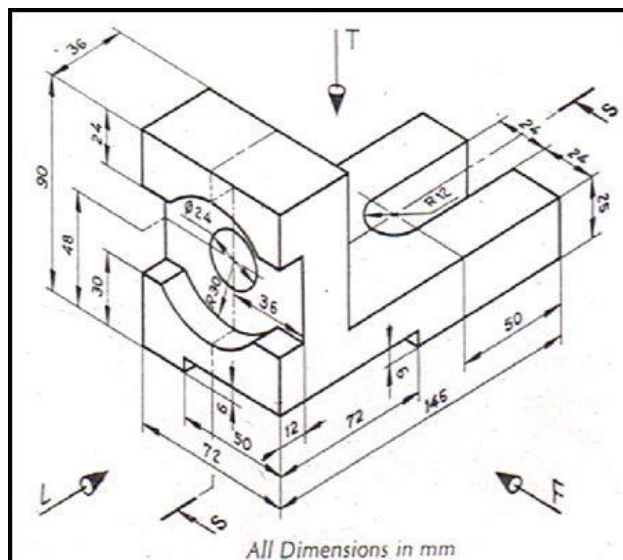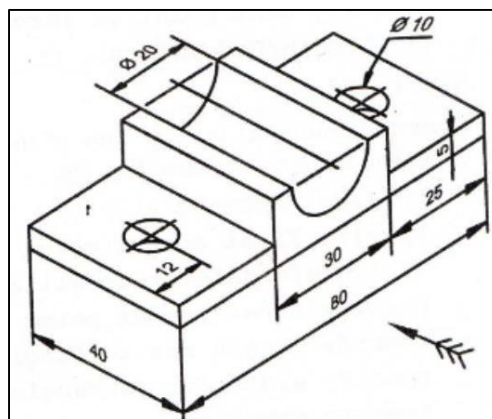
Expt: 5

Figure 5.1

All Dimensions in mm

Figure 5.2

Figure 5.3

Expt: 5   **Date:**

DRAWING ORTHOGRAPHIC PROJECTIONS OF SIMPLE SOLIDS

Aim:

To create the orthographic projections (front, top, and right view) of the given simple solids as required in AutoCAD 2016.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet (for A4 sheet set the Limits (0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: dimlinear**
   This command creates linear dimensions.
4. **Command: polygon**
   This command creates regular polygons in the drawing.
5. **Command: circle**
   This command creates circles in the drawing.
6. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
7. **Command: mirror**
   This command creates reflective symmetry in the drawing across a straight line.
8. **Command: pattern**
   This command creates several copies of the selected elements with regular spacing.

Expt: 5 OUTPUT

- ❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.
- ❖ Draw the border lines using the LINE command.
- ❖ Read the given solid model and get the required dimensions.
- ❖ Draw the front view of the solid model as required using LINE and CIRCLE commands. Then develop the top view and right view of the same.
- ❖ Use MIRROR command to utilize the reflective symmetry wherever possible.
- ❖ Use PATTERN command to create regular spaced copies of the drawing elements wherever possible.
- ❖ Show the dimensions using the DIMLINEAR command.
- ❖ Save the file in the drive as .dwg format.

Result:

Thus the orthographic projections for the given simple solids were constructed by using the standard CAD software – AutoCAD 2016.
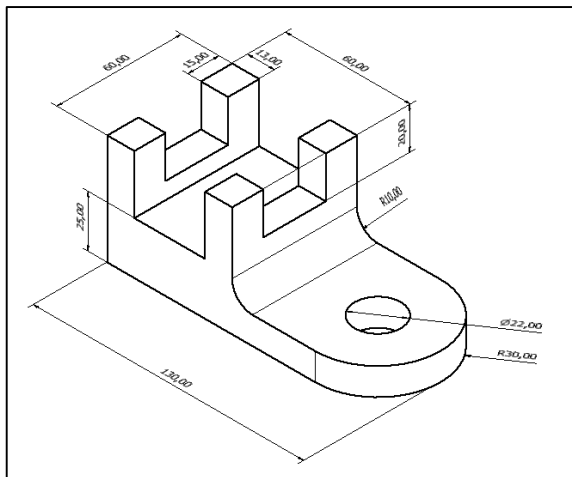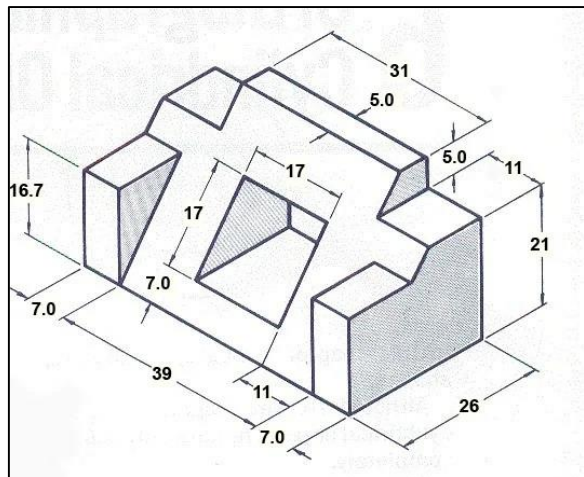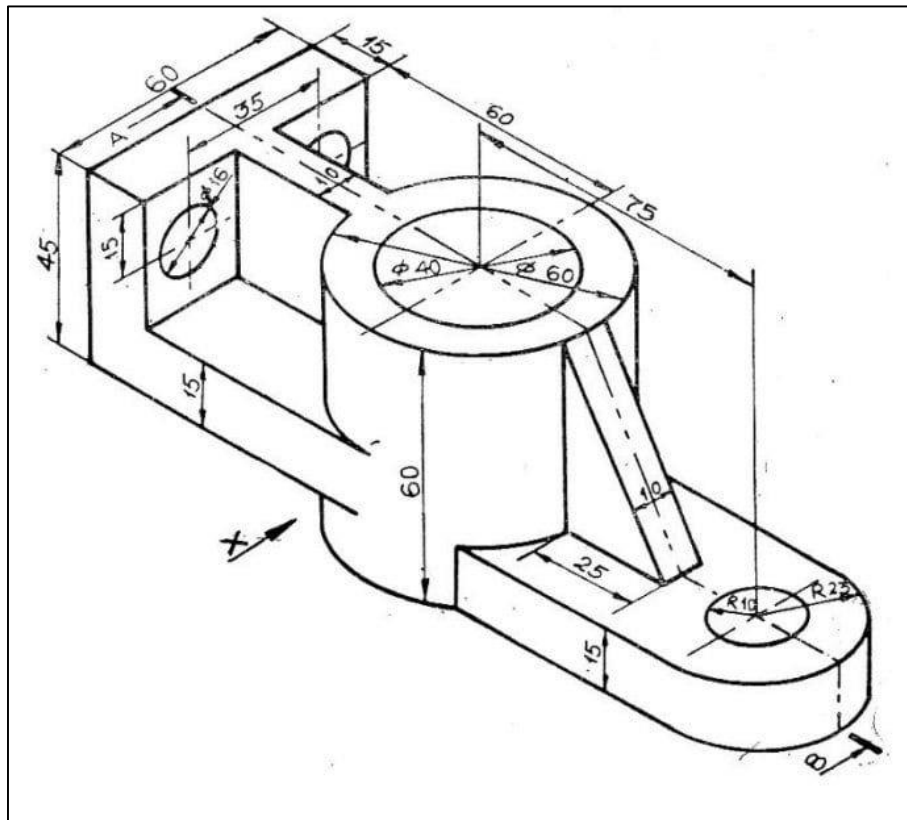
Expt: 6

Figure 6.1

Figure 6.2

Figure 6.3

Expt: 6   **Date:**

DRAWING ISOMETRIC VIEW OF SIMPLE SOLIDS

Aim:

To create the isometric projection of the given simple solids in AutoCAD.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet (for A4 sheet set the Limits (0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: dimlinear**
   This command creates linear dimensions.
4. **Command: ellipse**
   This command creates ellipse (or isocircle) in the drawing.
5. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
6. **Command: move**
   This command can be used to move and position the created drawing elements.

   The regular view of the AutoCAD workspace must be changed to Isometric drawing view, before starting the drawing.
   The key F5 can be used to switch between the planes – Isoplane front, Isoplane top, or Isoplane right.

Expt: 6 OUTPUT

- ❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.
- ❖ Draw the border lines using the LINE command.
- ❖ Set the drawing view to Isometric projection.
- ❖ Read the dimensions of the given solids.
- ❖ Draw the isometric drawing of the given solid using the LINE command and ELLIPSE – ISOCIRCLE command.
- ❖ Show the dimensions using the DIMLINEAR command.
- ❖ Save the file in the drive as .dwg format.

Result:

The given diagrams of simple solids were constructed in isometric projection drawings using the standard CAD software – AutoCAD 2016.
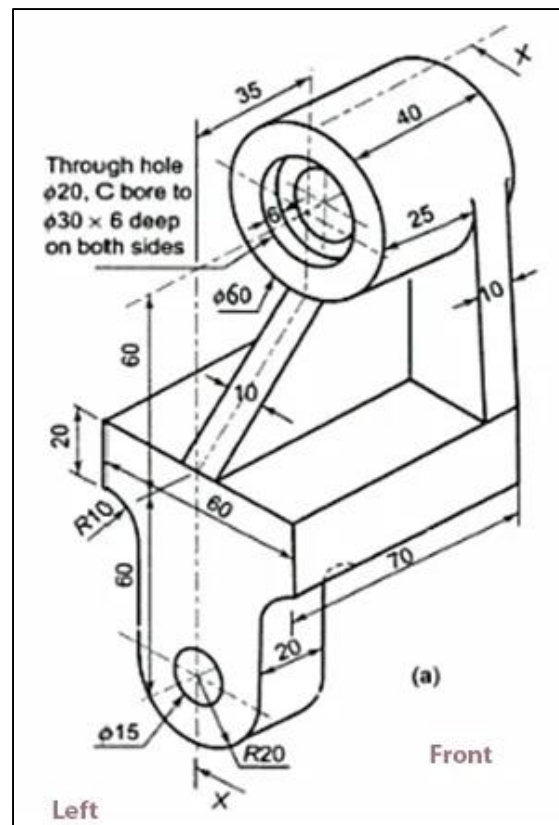
Expt: 7

Figure 7.1

Draw the section of the above figure at the plane parallel to front view and passing through the midspan of the component
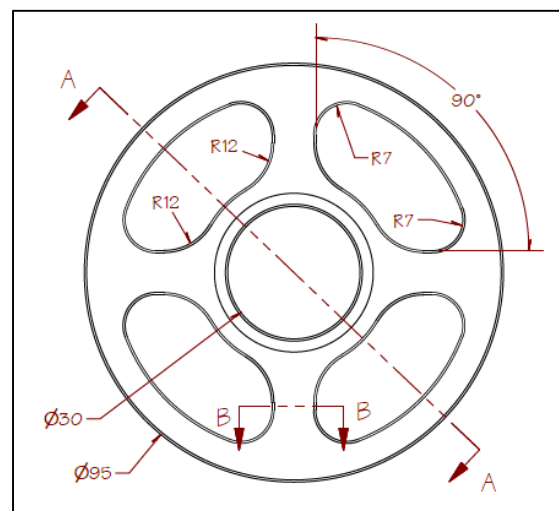

Figure 7.2

Draw the section view A-A. The wheel is 6mm thick, central rim 9mm thick with a 3mm fillet, web thickness 7mm.

Expt: 7   **Date:**

DRAWING SECTIONAL VIEWS OF SOLIDS

Aim:

To construct the various sectional views of the given solid using the AutoCAD software.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet (for A4 sheet set the Limits (0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: dimlinear**
   This command creates linear dimensions.
4. **Command: polygon**
   This command creates regular polygons in the drawing.
5. **Command: circle**
   This command creates circles in the drawing.
6. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
7. **Command: hatch**
   This command creates hatched regions that signify sections in the drawing.
8. **Command: fillet**
   This command creates filleted edges of required radius in the drawing.

Expt: 7 OUTPUT

❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.
❖ Draw the border lines using the LINE command.
❖ Read the drawing to identify the key features and dimensions that are to be included in the section view.
❖ Draw the sectional view using LINE, CIRCLE, FILLET commands
❖ Use the HATCH command to hatch the sectioned regions.
❖ Show the dimensions of the title block elements using the DIMLINEAR command.
❖ Save the file in the drive as .dwg format.

Result:

The sectional views of the given solid were constructed as required using the standard CAD software – AutoCAD 2016.

Expt: 8
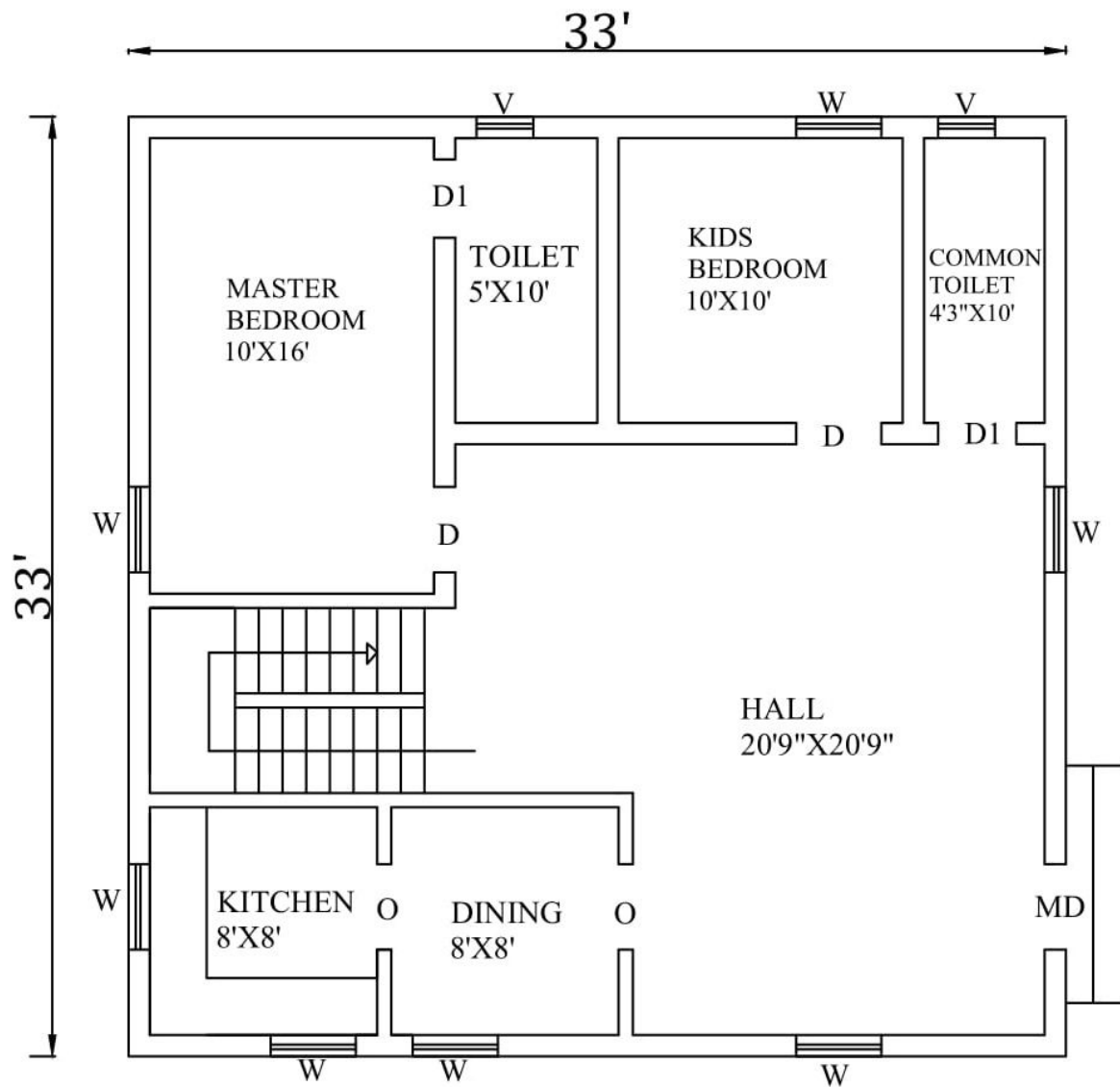
Residential Building Plan

Expt: 8   **Date:**

<div align="center">

DRAWING THE PLAN OF A RESIDENTIAL BUILDING

</div>

Aim:

To construct the plan view of the given single storey residential building using AutoCAD.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet (for A4 sheet set the Limits (0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: dimlinear**
   This command creates linear dimensions.
4. **Command: offset**
   This command creates regular spaced offset of the selected drawing shape.
5. **Command: circle**
   This command creates circles in the drawing.
6. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
7. **Command: hatch**
   This command creates hatched regions in the drawing.
8. **Command: move**
   This command can move and position the selected drawing elements in the drawing.

Expt: 8 OUTPUT

- ❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.
- ❖ Draw the border lines using the LINE command.
- ❖ Draw the outer extents of the building as per the given dimensions using LINE command.
- ❖ Partition the floor plan into individual rooms as required. Use OFFSET command to make offset of the room partitions to show wall thickness.
- ❖ Make symbols using LINE and ARC commands to show the doors and windows in each rooms.
- ❖ Use MTEXT command to specify the rooms and their area.
- ❖ Show the dimensions using the DIMLINEAR command.
- ❖ Save the file in the drive as .dwg format.

Result:

Thus the floor plan of the single storey residential building was created using the standard CAD software – AutoCAD 2016.
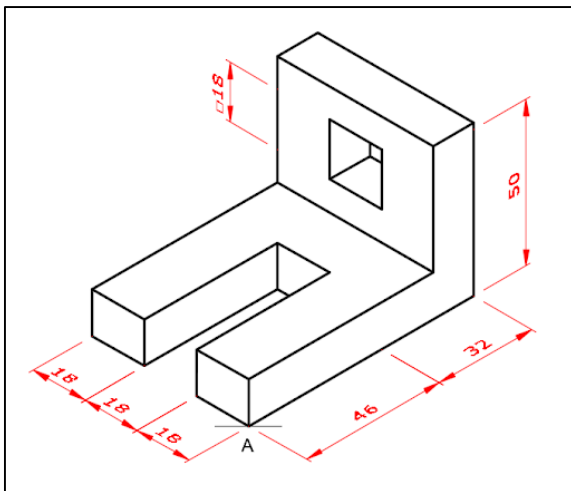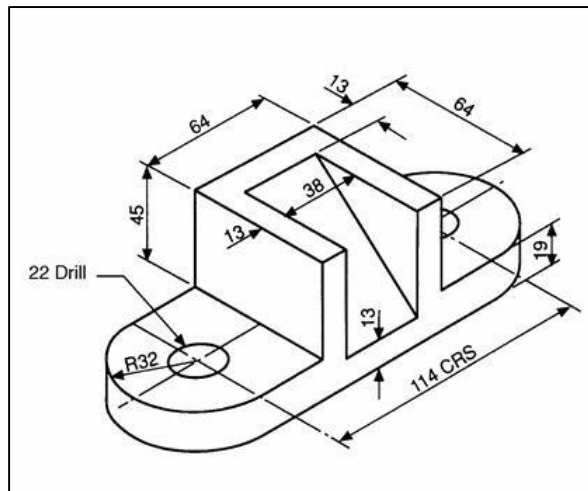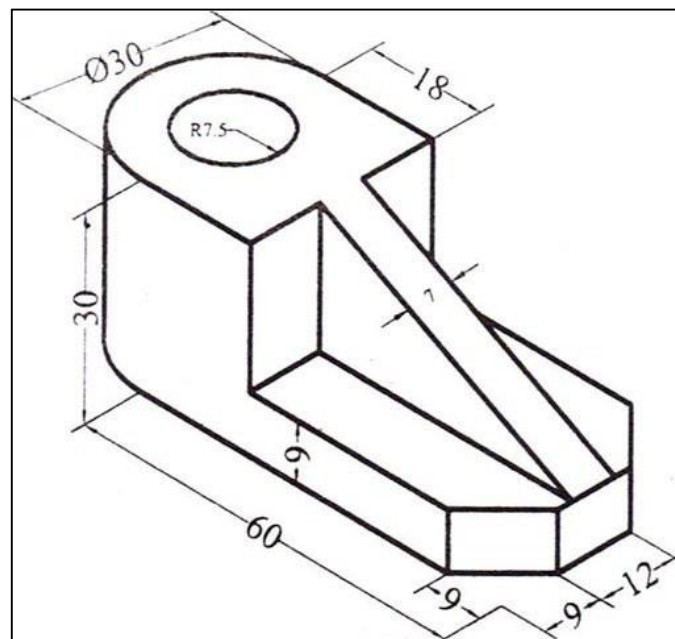
Expt: 9

Figure 9.1

Figure 9.2

Figure 9.3

Expt: 9   **Date:**

CONSTRUCTION OF 3D MODELS OF SIMPLE EXTRUSION SOLIDS

Aim:

To create the 3D models of the given simple extrusion solids in AutoCAD.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet (for A4 sheet set the Limits (0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: region**
   This command converts a 2D closed line drawing into a surface element.
4. **Command: extrude**
   This command creates extruded 3D solids from selected surfaces.
5. **Command: circle**
   This command creates circles in the drawing.
6. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
7. **Command: union**
   This Boolean command combines two or more connected (or overlapped) solids into a single solid.

Expt: 9 OUTPUT

8. **Command: subtract**

   This Boolean command removes one or more solids from a single solid when they are in overlap.

9. **Command: move**

   This command is used to move and position the selected elements in the drawing.

❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.

❖ Draw the border lines using the LINE command.

❖ Read the given drawing of the solids to identify the basic shapes and dimensions needed for its construction.

❖ Draw the basic 2D shapes using LINE, CIRCLE, and FILLET commands.

❖ Use REGION command to convert the basic shapes into surface entities.

❖ Use EXTRUDE command to convert the surface entities to solid entities of required dimensions.

❖ Place the solid entities in the corresponding relative positions using the MOVE command.

❖ With the Boolean commands, UNION or SUBTRACT, complete the final solid as given in the drawing.

❖ Show the dimensions using the DIMLINEAR command.

❖ Save the file in the drive as .dwg format.

Result:

Thus the 3D extrusion solids of the given drawing were created by using the standard CAD software – AutoCAD 2016.

Expt: 10

Figure 10.1

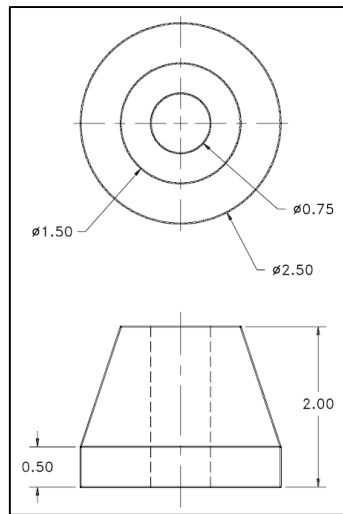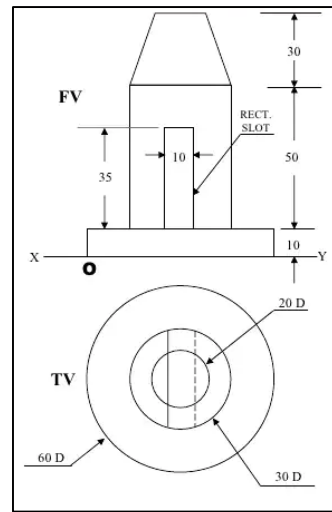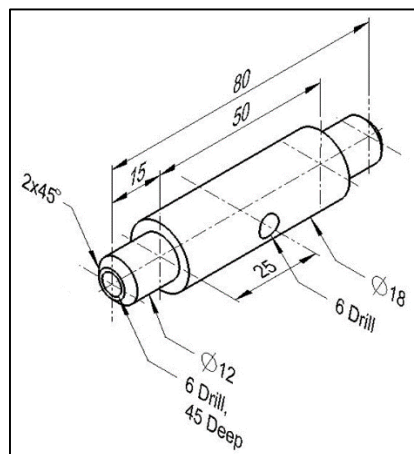Figure 10.2

Figure 10.3

Expt: 10   **Date:**

CONSTRUCTION OF 3D MODELS OF SIMPLE REVOLUTE SOLIDS

Aim:

To create the 3D models of the given simple revolute solids in AutoCAD.

System and Software:

System:

1. Intel Xeon E3 Processor, 3.20 GHz
2. 4 GB RAM
3. 21" flat monitor LCD
4. 400 GB hard disk
5. Printer

Software:

1. Operating system: Windows 7 Enterprise
2. AutoCAD 2016

Procedure:

1. **Command: limits**
   This command sets the screen to the required drawing sheet (for A4 sheet set the Limits (0,0) (210,297).
2. **Command: line**
   This command creates straight line segments
3. **Command: region**
   This command converts a 2D closed line drawing into a surface element.
4. **Command: extrude**
   This command creates extruded 3D solids from selected surfaces.
5. **Command: circle**
   This command creates circles in the drawing.
6. **Command: trim**
   This command trims/cuts/extends excess lengths of line segments.
7. **Command: revolve**
   This command creates axisymmetric 3D solids from selected surfaces.
8. **Command: union**
   This Boolean command combines two or more connected (or overlapped) solids into a single solid.

Expt: 10 OUTPUT

9. **Command: subtract**

This Boolean command removes one or more solids from a single solid when they are in overlap.

10. **Command: move**

This command is used to move and position the selected elements in the drawing.

❖ Set the sheet limits in the AutoCAD workspace using LIMITS command.

❖ Draw the border lines using the LINE command.

❖ Read the given drawing of the solids to identify the basic shapes and dimensions needed for its construction.

❖ Draw the basic 2D shapes using LINE, CIRCLE, and FILLET commands.

❖ Use REGION command to convert the basic shapes into surface entities.

❖ Use EXTRUDE or REVOLVE command to convert the surface entities to solid entities of required dimensions.

❖ Place the solid entities in the corresponding relative positions using the MOVE command.

❖ With the Boolean commands, UNION or SUBTRACT, complete the final solid as given in the drawing.

❖ Show the dimensions using the DIMLINEAR command.

❖ Save the file in the drive as .dwg format.

Result:

Thus the 3D revolute solids of the given drawing were created by using the standard CAD software – AutoCAD 2016.