LAB MANUAL

COMPUTER AIDED ELECTRICAL DRAFTING LAB (20EE44P)

IV SEM ELECTRICAL AND ELECTRONICS ENGINEERING

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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WEEK-1 **Date:**

1. INTRODUCTION to CAD commands. Practice essential, commands like – line types, line weight, scale, unit,
2. Layer, block, insert, explode, purge, table, and attribute, quick select
3. View, multi-view, break, join, filter, find, pan, list match properties and related commands
4. Practice the basic CAD commands.

Introduction to AutoCAD: The term CAD (Computer Aided Design) that allows the user to create drawings, plans, and designs. AutoCAD is one such program to create 2D and some 3D Drawings and it is very popular.

Advantages of CAD:

1. Saves time: When you are using the computer-aided design software, it will save your time and you can make better and more efficient designs in shorter time duration.

2. Easy to edit:. When you are using computer-aided design software, it will be much easier to make any changes because you can fix the errors and modify the drawings easily.

3. Decrease in error percentage: CAD software makes use of some of the best tools, to reduce percentage of error that occurred.

4. Decrease design effort: When it comes to the amount of effort that the software automates most of the task.

5. Code re-use: As the entire task is carried out with the help of computer tools, it removes the problem of duplication of labor, you can copy the different parts of code and design which can then be reused multiple times over and over again.

6. Easy to share: The CAD tools make it easier to save the files and store that you can use it time and again and send it.

7. Improved accuracy: There is absolutely no doubt about the fact that the kind of accuracy

Applications of AutoCAD

1. Architectural drawing of all kinds
2. Interior design and facility planning
3. Work-flow charts and organizational diagrams
4. Proposals and presentations
5. Graphs of all kinds
6. Drawings for electronic, chemical, civil, mechanical, automotive and aerospace engineering applications
7. Topographic maps and nautical charts
8. Yacht design
9. Plots and other representations of mathematical and scientific functions
10. Theater set-lighting designs
11. Musical scores
12. Technical illustrations and assembly diagrams
13. Company logos
14. Greeting cards
15. Line drawings for the fine art

CAD PACKAGES:

1. Auto Cad
2. Electrical Cad
3. 3DS-max
4. STADD
5. PRO-Engineer
6. IDEAS.
7. Mechanical desktop

The list of shortcuts for the commands

1. [l] – line
2. [pl] – polyline
3. [mt] – multiline text
4. [m] – move
5. [co] – copy
6. [ro] – rotate
7. [z] – zoom and [a] – all
8. [b] – block
9. [s] – stretch
10. [x] – explode
11. [ex] – extend
12. [c] – circle
13. [re] – regen (refresh)
14. [h] – hatch
15. [o] – offset
16. F3 – osnap
17. F8 – ortho

UCS ICON WCS is the short form of world co-ordinate system. This system represents X, Y and Z co-ordinates. X-axis is taken positive towards right, Y-axis is taken positive towards top and Z-axis is perpendicular to the screen. UCS is short form of User co-ordinate system. UCS is displayed two styles. They are 2D STYLE and 3D STYLE.

SETTING LIMITS OF A DRAWING. Drawing limits represents the boundaries of the drawing. LIMIT command is used to set drawing boundaries. Type LIMIT at the command prompt area using keyboard and the Enter key now the command prompt area ↵appears as shown below. Command: LIMITS

SETTTING UNIT OF A DRAWING: Unit command is used to set the units of measure. Angle measurement, direction and precision. Type units at the command prompt area by using keyboard and press the enter key now the command prompt area appears as: ↵Command: UNITS

DRAFTING SETTING: Drafting setting include the commands for initial setting of a drawing .some of the drawing settings are Snap, Grid, Object snap, polar tracking and ortho. Modes.
GRID: GRID command is used to display a reference grid of dots with any desired spacing. This visual display provides sense of the size of the drawing entities and their relationship.

SNAP: SNAP command is used to lock the movement of cross hair of the pointing device to the nearest grid point. Object snap:- Object snap settings are used to pick a geometric point on an object. There are various options for object snap settings such as End point, Midpoint, Center, Quadrant, Node, Intersection, perpendicular, tangent, Ect….

ORTHO: ORTHO command is used to constrain the movement of the cursor eight to horizontal or vertical direction. **Following are the functional keys in Auto CAD.**

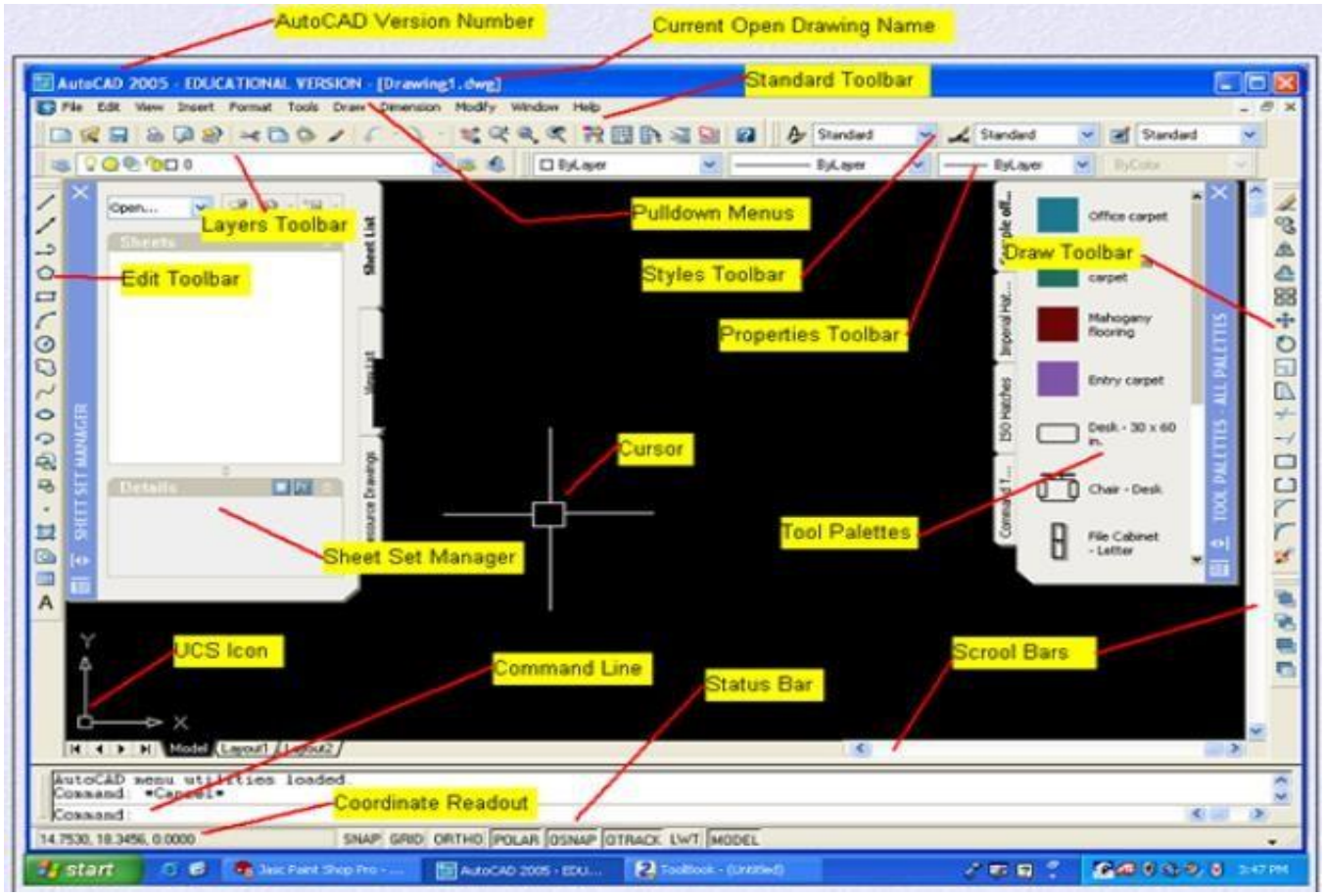
1. F1- Help
2. F2- Text window
3. F3- Object snap ON/OFF
4. F4- tablet ON/OFF
5. F5- Isoplane ON/OFF
6. F6- Co-ordinates ON/OFF
7. F7- Grid ON/OFF
8. F8- Ortho ON/OFF
9. F9- Snap ON/OFF
10. F10- Polar tracking ON/OFF
11. F11- Object snap tracking ON/OFF

UTILITY COMMAND

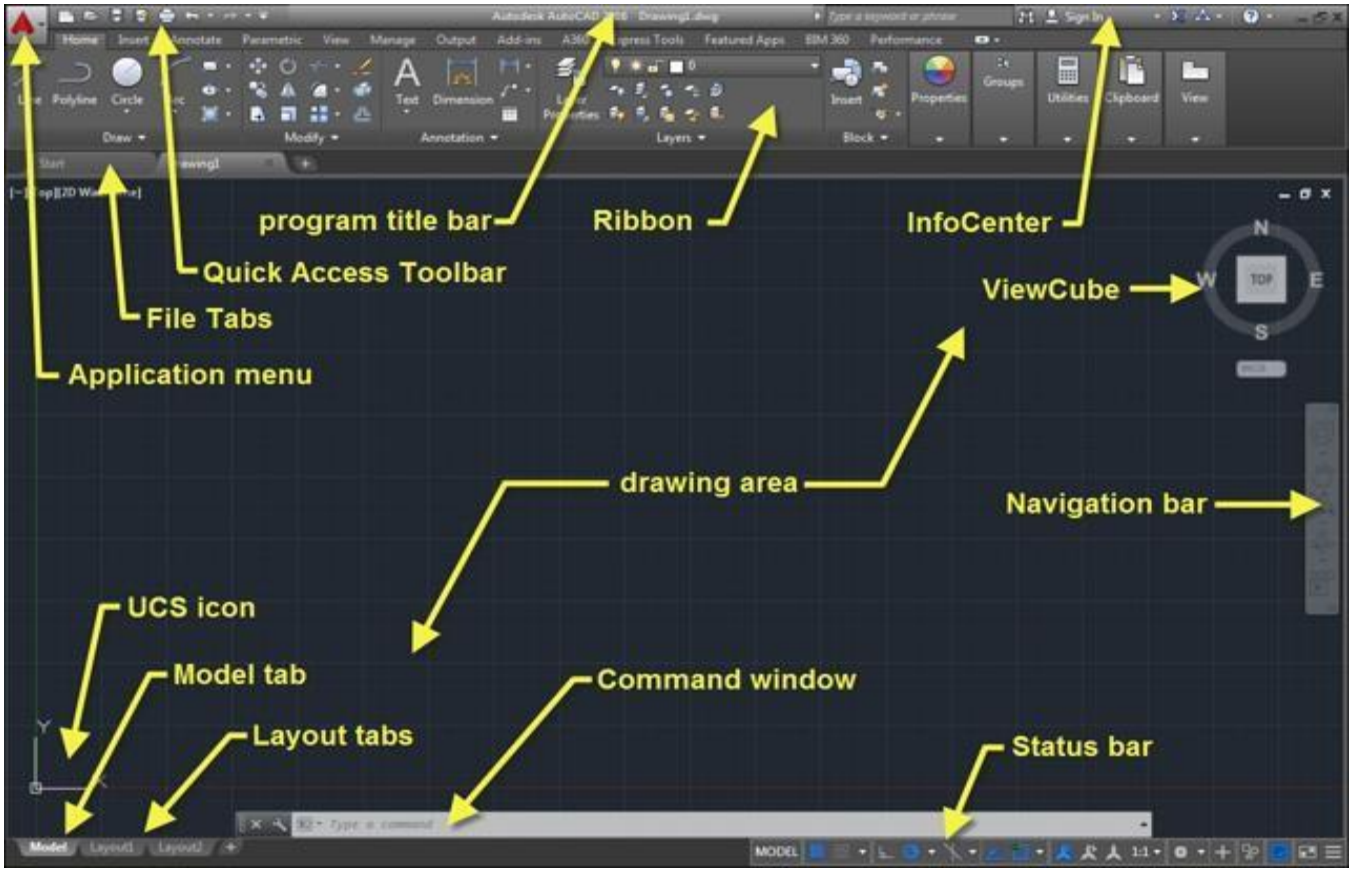
1. NEW being a new drawing .The new command allows you to create a new drawing.
2. SAVE This command can be used to save a un named drawing.
3. SAVE AS This command request a file name, save and sets. The current drawing to a new file name.
4. HELP or [?] The Help or 8?9 command can be used to find information about auto cad.
5. QUIT the quit command exit from Auto Cad.

	ARRAYPOLAR	Polar Array	Polar Array	Modify, Array, Polar Array
	ARRAYPATH	Path Array	Path Array	Modify, Array, Path Array
	ARRAYEDIT	Edit Array (on slideout panel)	Edit Array (on the Modify II toolbar)	Modify, Object, Array
	-ARRAY	not available	not available	not available
	OFFSET (O)	Offset	Offset	Offset
	TRIM (TR)	Trim (on drop-down button)	Trim	Trim
	EXTEND (EX)	Extend (on drop-down button)	Extend	Extend
	LENGTHEN (LEN)	Lengthen (on slideout panel)	Not Available	Lengthen
	BREAK (BR); two points	Break (on slideout panel)	Break	Break
	BREAK (BR); 1 point	Break at point (on slideout panel)	Break at point	Not Available
	EXPLODE (X)	Explode	Explode	Explode
	FILLET (F)	Fillet (on drop-down button)	Fillet	Fillet

Button	***Command***	***Draw Panel***	***Draw Toolbar***	***Draw Menu***
	LINE (L)	Line	Line	Line
	RAY	Ray (on slideout)	Not available	Ray
	XLINE (XL)	Construction Line (on slideout)	Construction Line	Construction Line
	PLINE (PL)	Polyline	Polyline	Polyline
	RECTANG (REC)	Rectangle	Rectangle	Rectangle
	POLYGON (POL)	Polygon (on the Rectangle drop-down menu)	Polygon	Polygon

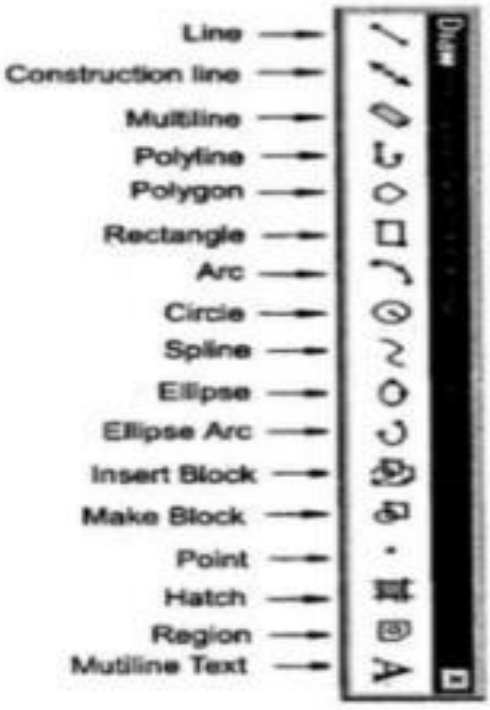


AutoCAD Version Number: Shows which AutoCAD Version you are running on.
Current Open Drawing Name : Shows the name of the drawing you currently have open
Standard Toolbar : Toolbar for standard AutoCAD Commands
Pull down Menus : Easy access to AutoCAD Commands
Layers Toolbar : Access AutoCAD Layer commands
Edit Toolbar : Access to AutoCAD editing commands
Styles Toolbar : Access AutoCAD Styles toolbar
Properties Toolbar : Access properties toolbar
Cursor : Used to point to objects in AutoCAD
Draw Toolbar : Access to AutoCAD draw commands
Tool Palettes : Access to tool pallettes
Scroll Bars : Used to scroll around drawing in drawing area
Status Bar : Used to turn on and off AutoCAD settings
Command Line : Used to type in AutoCAD commands from keyboard
Coordinate Readout : Used to keep track of cursor location in drawing area
Sheet Set Manager : Access sheet set manager

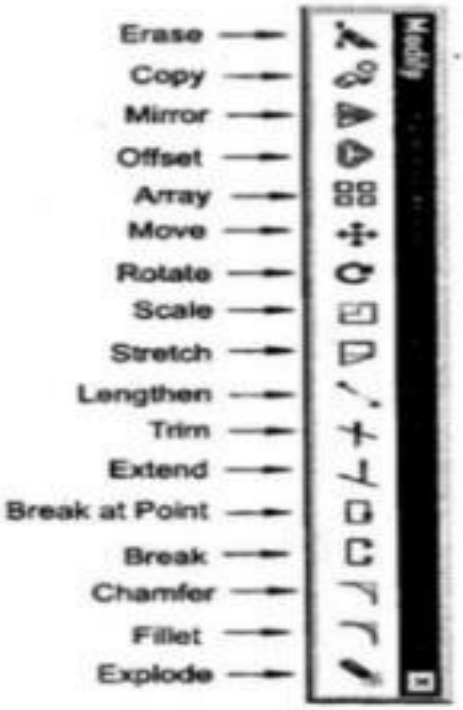


TOOL BARS

DRAW TOOL BAR



MODIFY TOOL BAR



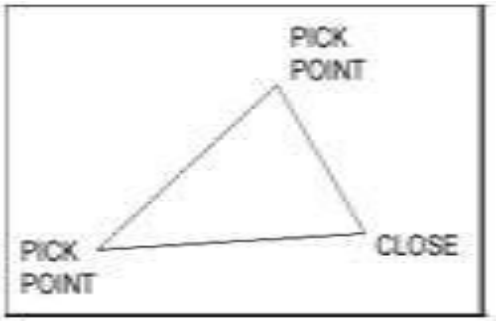
MODIFY COMMANDS

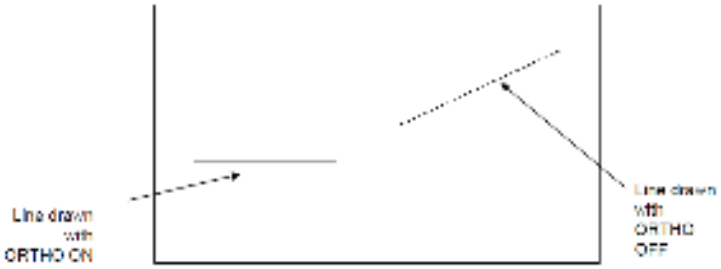
1. Erase – Erase object in the drawing area
2. Copy – Used to copy one or more objects
3. Mirror – Command used to mirror an exact duplicate of an object.
4 Offset – Used to offset one object from another a distance you specify
5. Extend – Used to extend one line to another
6. Array – Use to make a rectangular or polar array of an object
7. Move – Used to move objects around in the drawing area
8. Rotate – Used to rotate an object around a base point
9. Scale – Command used to make an object larger or smaller
10. Trim – Command used to trim an object from another object
11. Chamfer – Used to put a chamfer between two lines
12. Fillet – Used to put a fillet between two lines of a radius you specify

LINE COMMAND

Creates single straight line segments

1. **Choose** Draw, Line. **Or**
2. **Click** the Line icon.  **Or**
3. **Type** LINE from the command prompt Command: **LINE** or **L**
4. **Press** ENTER
5. **Pick** from point: (**point**)
6. **Pick** Specify next point or [Close/Undo] :(**point**)
7. **Pick** Specify next point or [Close/Undo] :(**point**)
8. **Press** ENTER to end line sequence
9. **Type** U to undo the last segment To point: **U** (undo) **Or**
10. **Type** C to create a closed polygon To point: **C** (close)





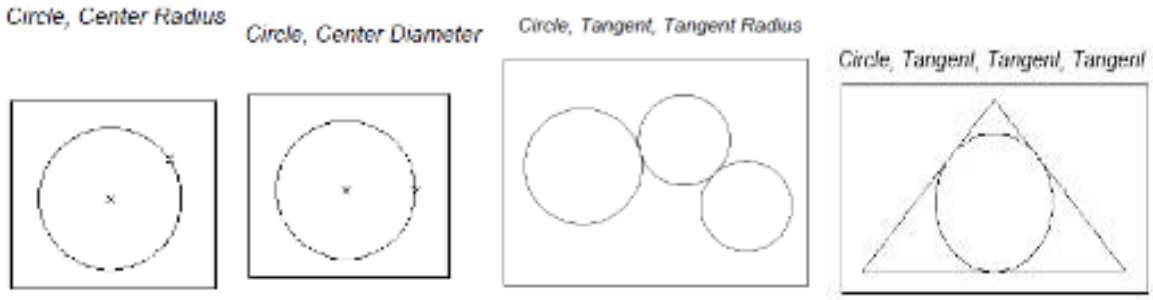
Orthogonal Lines

Controls lines from being drawn at various angles to straight lines. When the snap grid is rotated, ortho Mode rotates accordingly.

1. **Press** Function Key **F8 Or**
2. **Double Click** ORTHO from the Status Bar **Or**
3. **Press** CTRL + L.

2. Circles Circle Command

1. **Choose** Draw, Circle **Or**
2. **Click** the Circle icon **or**
3. **Type** CIRCLE at the command prompt. Command: **CIRCLE**
4. **Type** one of the following options: 3P/2P/TTR/<<center point>> **or**
5. **Pick** a center point.
6. **Type** a radius or diameter.
7. **Pick** a radius or diameter Diameter/<<radius>>:



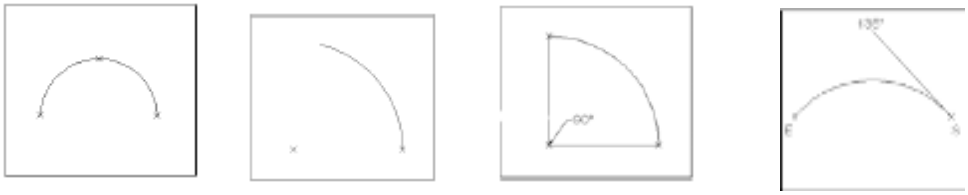
3. Arc Command

1. **Choose** Draw, Arc Or
2. **Click** the Arc icon Or
3. **Type** ARC at the command prompt Command: **ARC**
4. **Draw** one of the arcs.

Except for 3 point arcs, arcs are drawn in a COUNTERCLOCKWISE direction.

While in the arc command, press the right mouse button to select the following options

3 point arc start, center, and chord length



start, center, end | start, end, radius | start, center, angle | start, end, direction

4.Text Command

Text

Creates a single-line text object

1. **Type** TEXT at the command prompt Command: **TEXT Or**
2. **Pick** the Single Line Text icon from the Text Toolbar. 
3. **Pick** A start point Justify/Style/<Start Point>: (**point**) **Or**
4. **Type** J to change the justification or S to change the text style.
5. **Type** A text height Height <default>: (**type value or pick two points**)
6. **Type** A rotation angle Rotation angle <default>: (**angle or point**)
7. **Type** A text string Text: (**type text string**)
8. **Press** enter to exit the Text: prompt.

5. Layers

1. **Choose** Format, Layer **Or**
2. **Type** LAYER at the command prompt. Command: **LAYER (or LA) Or**
3. **Pick** the layers icon from the Layer Control box on the object properties toolbar.

Layer Options

Lists layers, with states, colors and line types.

Make Creates a new layer and makes it current.

Set Sets current layer.

New Creates new layers.

ON Turns on specified layers.

OFF Turns off specified layers.

Color Assigns color to specified layers.

Ltype Assigns line type to specified layers.

Freeze Completely ignores layers during regeneration.

Thaw Unfreezes specified layers Ltype.

Lock Makes a layer read only preventing entities from being edited but available visual reference and osnap functions.

Unlock Places a layer in read write mode and available for edits.

Plot Turns a Layer On for Plotting

No Plot Turns a Layer Off for Plotting

LWeight Controls the line weight for each layer

Instruction: Layers can be set using the command line prompts for layers. To use this, type –LAYER or -LA at the Command prompt.

1. **Type** Command: **-LAYER** or **LA**
2. **Type** One of the following layer options /Make/Set/New/ON/OFF/Color/Ltype/Freeze/Thaw:

6. Offset Command

Offset Distance

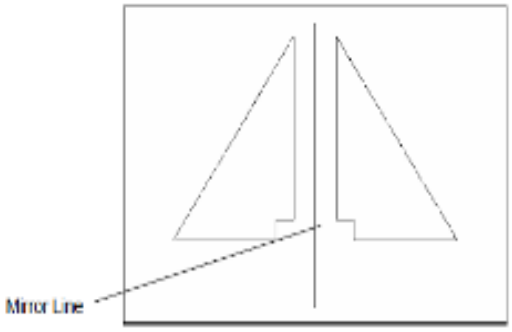
To offset a specified distance:

1. **Choose** Modify, Offset. **Or**
2. **Choose** the Offset icon. **Or**
3. **Type** OFFSET at the command prompt. Command: **OFFSET or O**
4. **Type** the distance to offset. Offset distance or <Through point>: (**number**)
5. **Pick** the object to offset. Select object to offset: (**select object**)
6. **Pick** A side to offset object to. Side to offset: (**pick side**)
7. **Pick** Another object to offset Select object to offset: (**pick side**) **or**
8. **Press** Enter to end the command.

7. Mirror

1. **Choose** Modify, Mirror. **Or**
2. **Click** the Mirror icon.  **Or**
3. **Type** MIRROR at the command prompt.Command: **MIRROR**
4. **Pick** Objects to mirror.Select objects: (**select**)
5. **Pick** First point of mirror line: (**point**)

6. **Pick** Second point: (**point**)
7. **Type** Yes to delete the original objects and No to keep them. Delete old objects? **Y** or **N**



ERASE COMMAND: Command used to erase objects in the drawing area

1. Draw a line and a circle of any length any diameter
2. Click on the ERASE icon in the edit toolbar
3. Select objects: Select all objects that you would like to erase with the pick box. When you are done selecting objects press ENTER on keyboard. The objects should disappear.

COPY COMMAND: Command used to copy objects in the drawing area

1. Draw a circle any diameter.
2. Click on the COPY icon in the edit toolbar.
3. Select objects: Select the circle with the pick box (on the line) when the circle is highlighted press the ENTER key on the keyboard.
4. Select objects: 1 found (This line ask you if you would like to select more objects if not press ENTER on the keyboard).
5. Specify base point of displacement: Pick with the near the center of the circle
6. Move the object to the location you desire and click down with the mouse.

MIRROR COMMAND: **Command** used to mirror an object to the side of another object

1. Draw a rectangle any size using the rectangle command
2. Click the MIRROR icon in the edit toolbar
3. Select objects: Select the rectangle with the pick box (on the line)
4. Select objects: Press ENTER on the keyboard
5. Specify point on mirror line: Move your cursor to the right and above a short distance from the rectangle. Click down with the mouse.
6. Specify first point of mirror line: Specify second point of mirror line: moves your cursor down a short distance then click down with the mouse
7. Delete source

OFFSET COMMAND: **Command** used to offset one object from another

1. Draw a circle and a line of any diameter any length
2. Click on the OFFSET icon in the edit toolbar. 3. Specifyoffset distance Type int: .50 (press enter)
4. Select object to offset Select the line with the pick box.
5. Specifypoint on side to offset: Pick just above the line you have selected in step 4 with the cursor. An exact duplicate of the first line you selected in step 4 is created just above .50 distances away

6. Select object to offset press ENTER on the keyboard. You can offset almost any object in the drawing area. You can offset text. You can also offset a circle to the inside or outside itself.

EXTEND COMMAND; Command used to extend one line to another

1. Draw two lines one horizontal and one vertical. Draw the vertical line a short distance away from the horizontal line.
2. Click on the EXTEND icon in the edit toolbar.
3. Select boundary edges. Select objects the vertical line (the line you want to extend to).
4. Press ENTER on the keyboard
5. Select objects to extend select the right end point of the horizontal line with the pick box. The horizontal line will now extend to the vertical line.
6. Press the ESC key on the keyboard to cancel the command.

ARRAY COMMAND: **How** to do a rectangular array

1. Start a new drawing from scratch.
2. Draw a polygon, 6 sides, inscribed, with a radius of .50
3. Click on the ARRAY icon in the edit toolbar the array dialog box opens
4. Set ROWS to 6, set COLUMNS to 6.
5. Set ROW OFFSET to 1.5 set COLUMNS OFFSET to 1.50
6. Click on SELECT OBJECTS icon.
7. Select the polygon with the pick box (on the line) then press ENTER on the keyboard
8. Click on OK

POLAR ARRAY

1. Draw two circles diameter
2. Click on the ARRAY icon the array dialog box opens
3. Click on POLAR ARRAY
4. Click on SELECT OBJECTS icon Click on the small circle (on the line) then press ENTER on the keyboard.
5. Click on the PICK CENTER POINT icon Type in CEN (press enter), Move the cursor over to the large circle (on the line) when a small circle appears at its centre click down with the mouse.

6. Set TOTAL NUMBER OF ITEMS to 6, set ANGLE TO FILL to 360
7. Click on OK. 6 small circles should appear around the larger circle.

MOVE COMMAND; Command used to move an object from one location to another in the drawing area

1. Draw a circle of any diameter
2. Click on the MOVE icon in the edit toolbar
3. Select objects: Select the circle (on the line) then press ENTER on the keyboard
4. Specify base point of displacement Select near the center of the circle with the cursor.
5. Specify second point of displacement. If you move your cursor around little in the drawing area you can see what is called rubber banding.
6. Click down the mouse anywhere within the drawing area at the desired location for the move.

ROTATE COMMAND: Command used rotates an object around a point you pick

1. Draw a rectangle with only two equal sides rectangle command
2. Click on the ROTATE icon in the edit toolbar
3. Select objects: Select the rectangle (on the line) then press ENTER on the keyboard
4. Specify base point select somewhere near the center of the rectangle with the cursor.
5. Specify rotation angle At this point you can type in an angle of rotation at the command line or by moving your mouse around you can dynamically see the rotation angle, and then click down with the mouse when you like the rotation angle.

TRIM COMMAND; Command used to trim one line back from another line

1. Draw two overlapping line one horizontal and one vertical
2. Click on the TRIM icon from the edit toolbar
3. Select cutting edges. Select objects: Select the Vertical line with the pick box (this will be your cutting edge).
4. Press ENTER on the keyboard
5. Select object to trim: Select the horizontal line the part to the right of the vertical line (this is your object to trim).
6. Press the ESC key on the keyboard to exit the command

CHAMFER COMMAND: Command use to put a chamfer between two connecting lines

1. Draw a 1″ horizontal line and a 1″ vertical line joined at endpoints.
2. Click on the CHAMFER icon in the edit toolbar 3. Select first line Type in D (press enter) this is to set the distance of the chamfer.
4. Specify first chamfer distance Type in 25 (press enter)
5. Specify second chamfer distance Type in: 25 (press enter)
6. Select first line Select the horizontal line somewhere close to the endpoint near the vertical line (But not on the endpoint itself with the pick box.
7. Select second line select the vertical line some whereas close to the endpoint near the horizontal line (but do not select the endpoint itself with pick box. You should now have a .25 chamfer at 45 degrees.

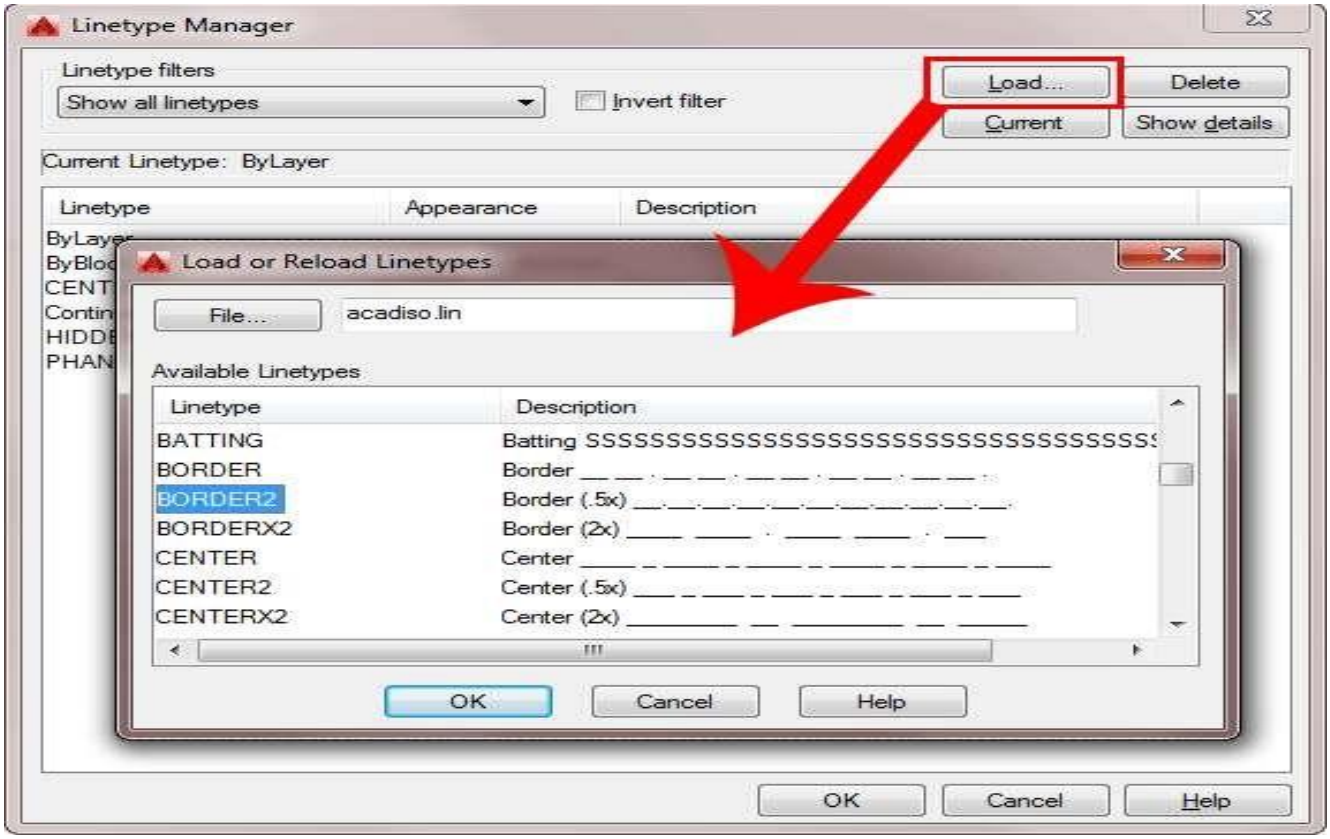
FILLET COMMAND:

1. Draw a 1″ horizontal Line and a 1″ vertical line joined at endpoints.
2. Click on the FILLET icon in the edit toolbar.
3. Select first object Type in R (press enter) this is to set the fillet radius.

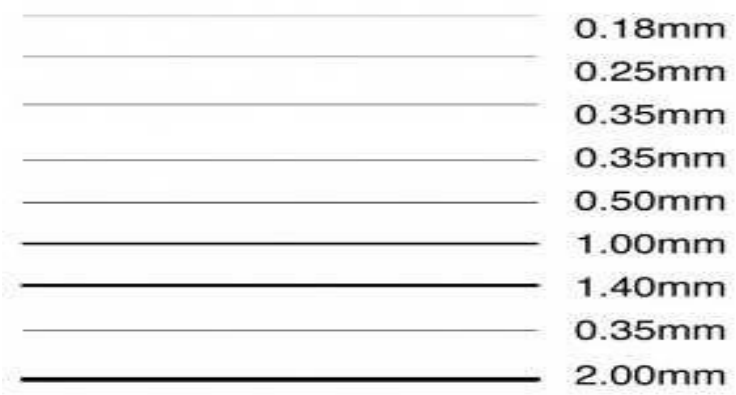
4. Specify fillet radius Type in .25 (press enter)
5. Select first object: Select the Horizontal line somewhere near the endpoint close to the vertical line (do not click on the endpoint itself with the pick box.
6. Select second object: Select the vertical line somewhers near the endpoint close to the horizontal line (do not pick on the end point itself) with the pick box. Now there should be a fillet with a radius of .25 between the two lines

LINE TYPE: This is a particular line type. Drawings can be drawn with this one line type. More advanced drawing will require different line types such as centre line, hidden lines, phantom lines and others.

When you first start AutoCAD the default template has only one line type is available. This is the continuous line type.autocad has many more. If you need a different line type, you must load it into your current drawing



LINE WEIGHT: there is option of turning the line weight display on of off. Just click on the LWT status bar .below the icon indicates that line weights are shown below.



SCALE: Enlarges or reduces selected objects, keeping the proportions of the object the same after scaling.


Find

To scale an object, specify a base point and a scale factor. The base point acts as the centre of the scaling operation and remains stationary. A scale factor greater than 1 enlarges the object. A scale factor between 0 and 1 shrinks the object.The following prompts are displayed.

Select objects: Specifies which objects you want to resize.

Base point; Specify a base point for the scale operation.

The base point you specify identifies the point that remains in the same location as the selected objects change size (and thus move away from the stationary base point).

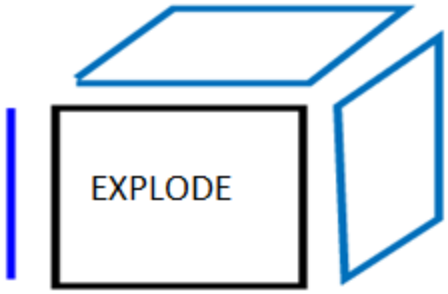
BLOCK: A static block is a virtual grouping that may contain models and other block lists. A dynamic block usually contains combinations of lines, curves, surfaces and solid. The major difference between dynamic and static blocks is the methods with which they are inserted or created.

1. Open the block in the Block Editor.
2. In the Block Editor, make sure nothing is selected.
3. In the Properties palette (Ctrl+1), under Block, select the Allow Exploding option.
4. From the drop-down list, select **Yes**.
5. On the Block Editor Toolbar, click Save Block Definition.
6. When you are finished using the Block Editor, click Close the Block Editor.

INSERT

This command is used to insert a block , any other drawing file or items in any other format into the current file.

EXPLODE: The Explode command deconstruct an object into its constituent parts. If you use the RECTANG command the EXPLODE command to separate the rectangle into four lines, allowing to utilize each line independently. This command can also be used after creating an ARRAY with Associative elements. The EXPLODE command can be used to get rid of the array's associative functionality.



ATTRIBUTE: An attribute is a label or tag that attaches data to a block. Examples of data that might be contained in an attribute are part numbers, prices, comments, and owners' names.

The WBlock command creates a new drawing file containing either:

1. the objects that make up a selected block
2. selected objects
3. all objects in the drawing, on the layers

Attributes are used inside blocks. They are special text that you may want to change in the block. They are not used in the wblock command. Put in attributes along with the other objects in the block when you make it. When you insert the block it will ask if you want to change what the attributes say, or you can change them later.

PURGE: Using the PURGE command will help to reduce these file sizes. PURGE will delete all the unused blocks, layers, line types, and other attributes from the file. You can always select which objects to delete, but only items that are not in use can be removed. PURGE can dramatically reduce file sizes and is always worth using this command before saving a file.

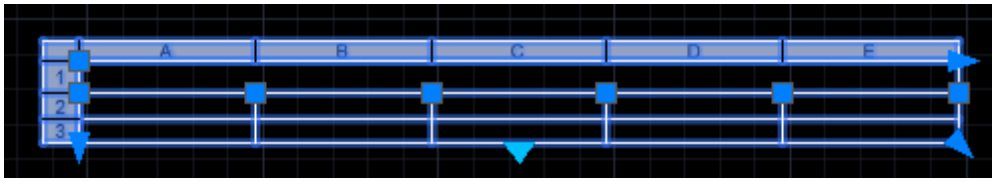
AUTOCAD TABLE; the table command in AutoCAD is used to insert the table containing rows and columns. We can resize the rows and columns, and can also stretch the entire table. We can insert the appropriate data in rows and columns according to the requirements.
The steps are listed below:

1. Type **TABLE** on the command line or command prompt and press **Enter**.
2. A dialog box will appear, a shown below:
3. Specify the columns, column width, data rows, and row height, as shown in above image.
4. Click on the **OK** button at the bottom.

1st and **2nd** rows are the **Title** and **Header**. The row after the 2nd row will be the specified rows. Since, we have specified only **1** row; the total rows will be **3**, as shown below

5. To modify the shape and size of the created table, click on the table, as shown below:

Select the **blue triangle** and drag the triangle to the desired position, as shown below:



6. Press **Enter**.

Adding Information to the created table

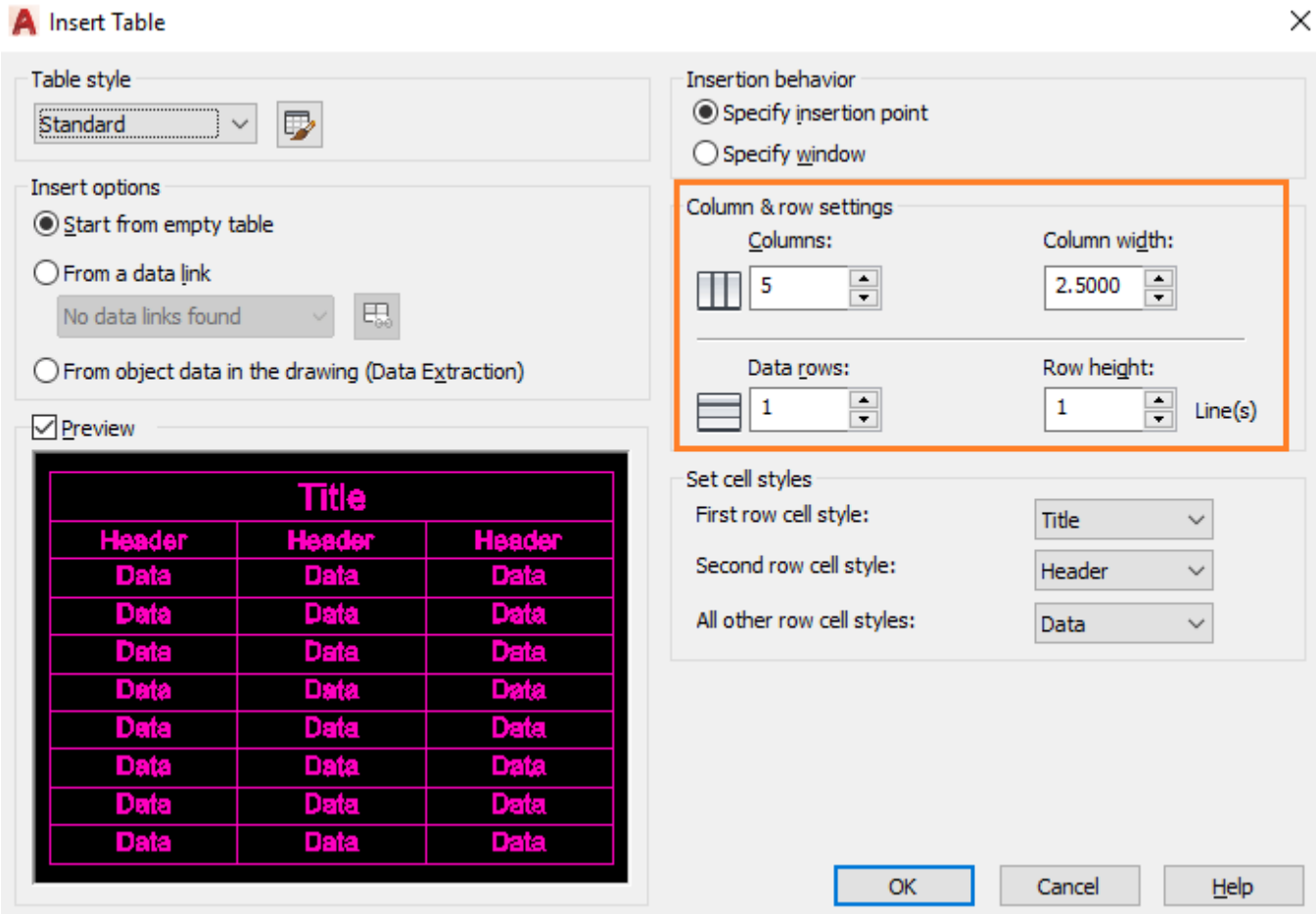
After creating the table, we are required to insert text inside the table.
Here, we can also perform calculations inside the table.
Let's discuss this in detail.
8. Double-click on each cell.
9. Write the text, as shown below:

We can modify the size of the text, which is present on the top of the display, as shown below:

10. Continue writing on other blocks by clicking. The table will now appear as:

Data Format

11. To change the data format of the table, click on the cell
12. A dialog box will appear,



QUICK SELECT: The Quick Select dialog box is a simple filtering device that helps you select the objects you want. For more advanced filters and for when you want to save filters, use the **FILTER** command.

There are 4 ways to open Quick Select in AutoCAD

- Home tab> Utilities panel>Quick Select
- With no command active, right-click in the drawing area and choose Quick Select
- Click the Quick Select button in the Properties palette
- Type **qselect** on the command line.

There are many ways to simplify your selection with Quick Select function

So open the Quick Select tool using one of the 4 methods described above then follows this steps

1. Under object type, select circle
2. For properties, select Radius. Note: you can see here all the perimeters that you can use to define your selection.
3. Under value, key in 750 then click OK

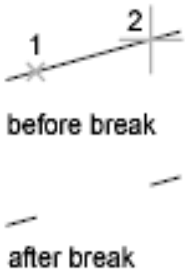
VIEW: Saves and restores named model space **views**, layout **views**, and preset **views**.
Find.The **View** Manager is displayed. Note: The **VIEW command**.

MULTIPLE VIEW; Use the command **"MV" multiple view**- select object option and click on the rectangle, then the drawing will be displayed in the viewport. Similarly do it for the second rectangle. Command "MS" for model space and click on the viewport we need to set the drawing.

BREAKE: **Breaks the selected object between two points**. A gap between two specified points on an object, breaking it into two objects. If the points are off of an object, they are automatically projected on to the object.Breaks the selected object between two points.


Find

First point; Overrides the original first point where you selected the object with a new point that you specify.



JOIN: Type J or join on the command line and press Enter. We need to select multiple objects to join. The selected objects are joined at once. The **Joint** command in AutoCAD is used to join the objects end to end to create a single object. The objects can be curved or linear, depending on the requirements. note: the objects namely rays, closed objects and construction line cannot be joined using the join command.,

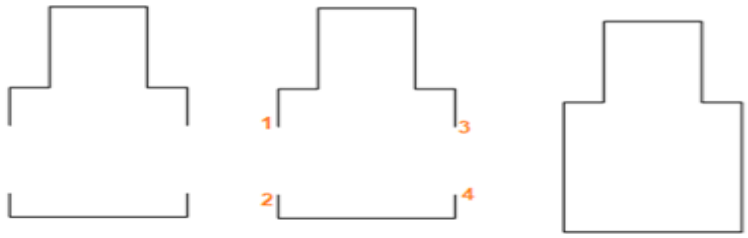
Steps to join any object

1. Select the **Join** command from the ribbon panel under the Modify interface.
   Or Type **J** or **join** on the command line and press **Enter**.
2. We need to select multiple objects to join. The selected objects are joined at once.
3. Press **Enter**.

The selected objects will be joined as a single unbreakable object.

Example:

Here, we will consider the below figure.



We are required to join the segments numbered 1, 2, 3, and 4. These segments are shown below:

The steps to join the segments marked above are:

1. Type **J** or **join** on the command line or command prompt and press **Enter**.
2. Select segments **1** and **2**.
3. Press **Enter**
4. Select segments **3** and **4**.
5. Press **Enter**.

Filter

The FILTER command allows you to create a selection set according to a specific list of property criteria.

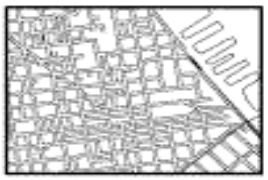
Find

The FIND command is used to find specified text. Users could replace certain text according to needs.

PAN: Pan: Changes your view of your drawing the view while keeping the viewing direction and magnification the same.Shifts the view by specifying up to two points to determine a distance and direction.

You can specify a single point, indicating a relative displacement of the view, or you can specify two points, in which case the displacement is computed from the first point to the second point.

before PAN



after PAN

For example, if you specify **2,2** at the first prompt and press Enter at the second prompt, the drawing is moved 2 units in the *X* direction and 2 units in the *Y* direction. If you specify a point at the Specify Second Point prompt, the location of the first point is moved to the location of the second point.

Base point or displacement

Specify a point that represents one of two values:

- First and only point. Represents the relative amount of view displacement.
- First of two points. Represents the base point that will be moved to the second point.

Second point

Specifies point to which the first point moves. Leave this prompt empty to use the first point as a displacement value.

List match properties and related commands

The Match Properties command **allows you to quickly copy properties such as layer, color, and line type from one AutoCAD entity and apply them to another**.

Once the command has been activated, you will be prompted to select the source object, i.e. the object whose properties you would like to copy. You will then be asked to select the destination objects, i.e. the new objects you would like to apply the properties to. If you would like to control which properties are transferred, type 8s9 into the command line and press enter for 8settings9.

This will open the property settings dialogue box where all boxes are ticked by default. Here, you can untick any properties you would not like copied to the new object. Select OK.Select the objects you would like to transfer these properties to and press enter to finish.

Signature of staff

2a.Single line diagram of 11KV Substation. Date:

AIM: To draw Single line diagram of 11KV Substation using CAD tools.

COMMANDS USED

Line, Circle, Trim, Copy, Mirror, Fillet, Text, Hatch, Dimension

HARDWARE AND SOFTWARE REQUIREMENTS

Computer with its accessories

AutoCAD package

PROCEDURE

1. Open AutoCAD from desktop]↵ DRAWING LIMITS [LIMITS →
2. Set the drawing limits by clicking, FORMAT from menu bar and set the required values for both lower and upper limits. ZOOM ALL to get enlarged view.→ ZOOM →
3. Then click on VIEW MENU]↵ A ↵[Z UNITS→
4. Set the units and precision from the format menu by clicking FORMAT] ↵[UN] from the draw toolbar and drawn the horizontal and↵
5. Click on the LINE [L vertical line.

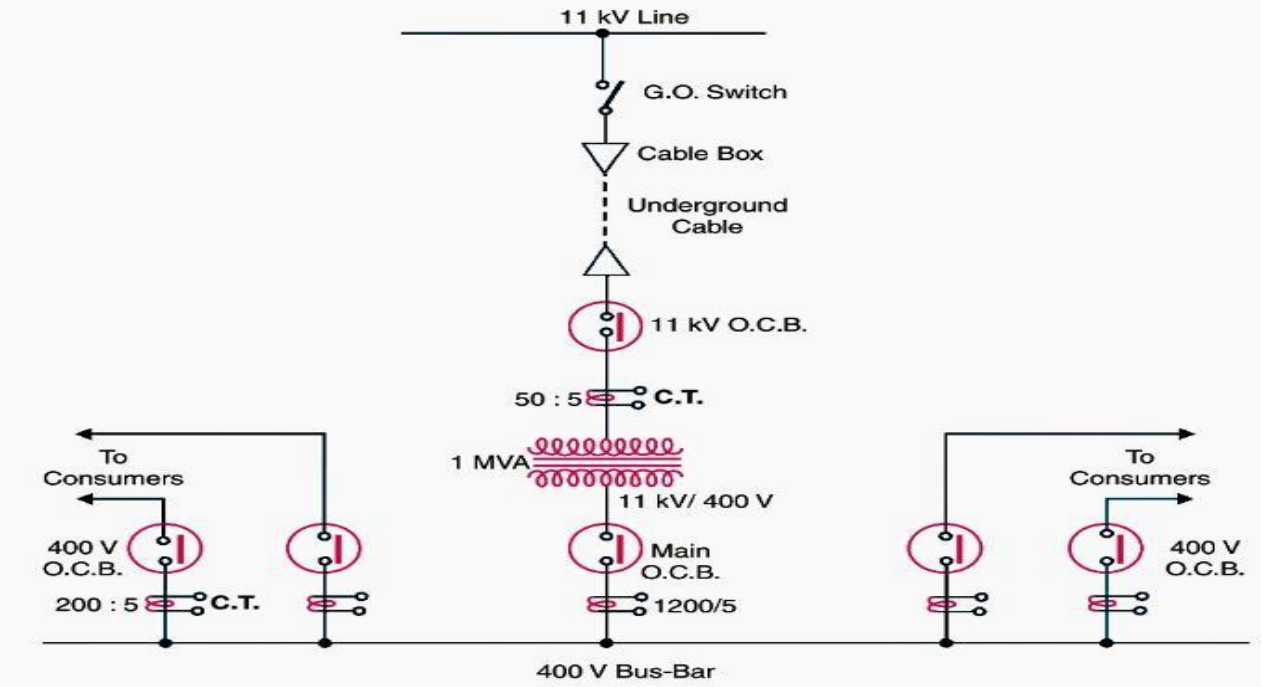
6. To change the properties of LINE Click on line type control from properties toolbar. And click on other .then load the required line type from line type manager. then select the line and change it in to the required line type command from modify toolbar

7. Select CIRCLE [C and enter the radius.] command from the modify toolbar to remove the drawn.↵

8. .Click on the TRIM [TR line at required point.

9. Finally the outer dimensions are shown by clicking dimensions from the menu bar and ↵give the required dimensions.[DLI &]↵DCO SAVE→

10. The drawings is saved by clicking FILE



RESULT: Single line diagram of 11KV Substation drawn using CAD tools signature of staff

2b.Single line diagram of 110 KV/11KV MUSS. Date:

AIM: To draw Single line diagram of 110 KV/11KV MUSS using CAD tools.

COMMANDS USED

Line, Circle, Trim, Copy, Mirror, Fillet, Text, Hatch, Dimension

HARDWARE AND SOFTWARE REQUIREMENTS

Computer with its accessories
AutoCAD package

PROCEDURE

1. Open AutoCAD from desktop]↵ DRAWING LIMITS [LIMITS →
2. Set the drawing limits by clicking, FORMAT from menu bar and set the required values for both lower and upper limits. ZOOM ALL to get enlarged view.→ ZOOM →
3. Then click on VIEW MENU]↵ A ↵[Z UNITS→
4. Set the units and precision from the format menu by clicking FORMAT] ↵[UN] from the draw toolbar and drawn the horizontal and↵
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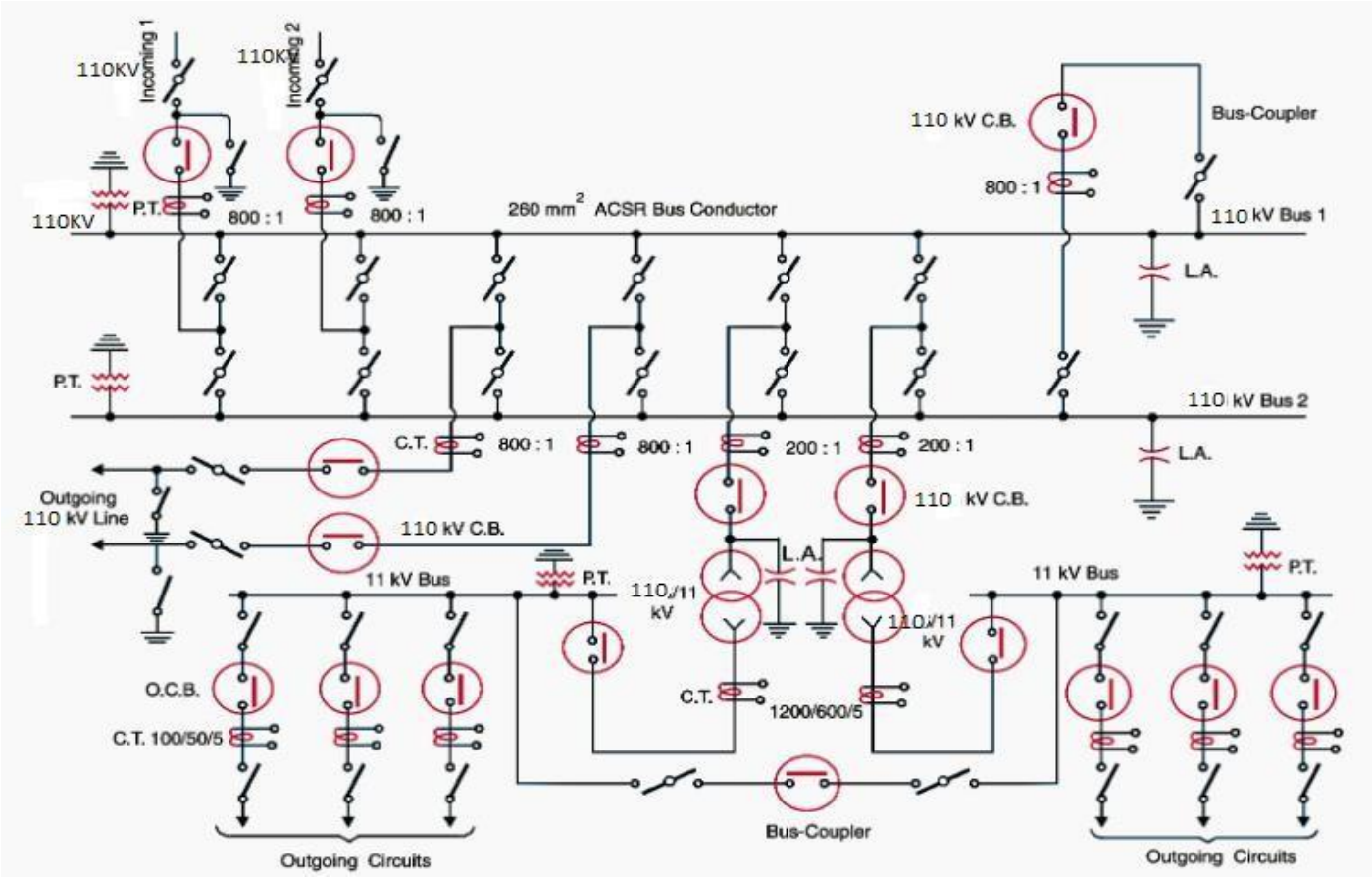
6. To change the properties of LINE Click on line type control from properties toolbar. And click on other .then load the required line type from line type manger.then select the line and change it in to the required line type command from modify toolbar
7. Select CIRCLE [C and enter the radius.] command from the modify toolbar to remove the drawn.↵
8. .Click on the TRIM [TR line at required point.
9. Finally the outer dimensions are shown by clicking dimensions from the menu bar and ↵give the required dimensions.[DLI &]↵DCO SAVE→
10. The drawings is saved by clicking FILE

Single line Diagram

RESULT: Single line diagram of 110 KV/11KV MUSS drawn using CAD tools signature of staff



WEEK-3

1. Draw and Create BOM (Bill of Material): Electrical wiring of a residential/Hospital building. Date:

AIM: To draw and Create BOM (Bill of Material): Electrical wiring of a residential building using CAD tools.

COMMANDS USED

Line, Circle, Trim, Copy, Mirror, Fillet, Text, Hatch, Dimension

HARDWARE AND SOFTWARE REQUIREMENTS

Computer with its accessories
AutoCAD package

PROCEDURE

1. Open AutoCAD from desktop]↵ DRAWING LIMITS [LIMITS →
2. Set the drawing limits by clicking, FORMAT from menu bar and set the required values for both lower and upper limits. ZOOM ALL to get enlarged view.→ ZOOM →
3. Then click on VIEW MENU]↵ A ↵[Z UNITS→
4. Set the units and precision from the format menu by clicking FORMAT] ↵[UN] from the draw toolbar and drawn the horizontal and↵
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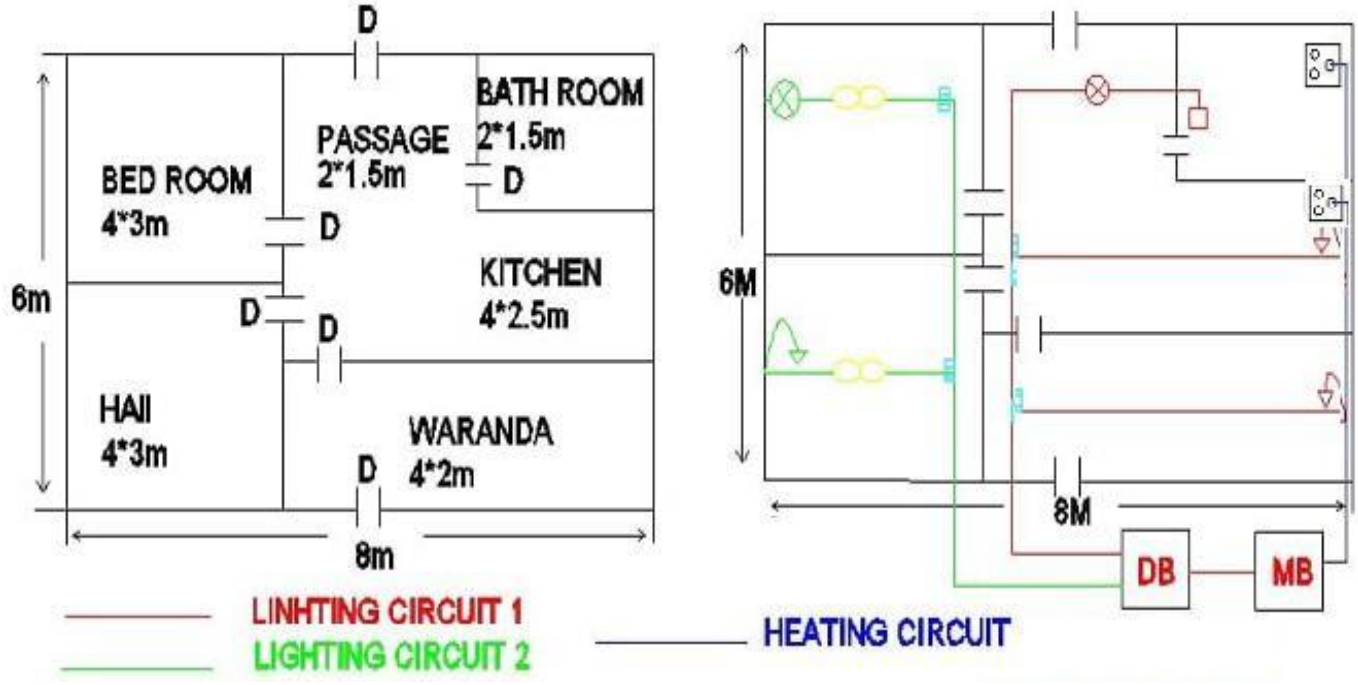
7. Select CIRCLE [C and enter the radius.] command from the modify toolbar to remove the drawn↵
8. .Click on the TRIM [TR line at required point.
9. Finally the outer dimensions are shown by clicking dimensions from the menu bar and ↵give the required dimensions.[DLI &]↵DCO SAVE→
10. The drawings is saved by clicking FILE



Estimation of cost for lighting load:

Sl.no	Particulars	unit	quantity	Rate in Rs.	Cost in Rs.
1.	32A,250V flush type DP switch	No	1 no	150-00	150-00
2.	4A,240V SP MCB	No	1 No	120-00	120-00
3.	20mm dia PVC pipe with 2mm thickness	Length (3M)	40 M	50-00	666-67
4.	1 sq.mm multi strand pvc copper cable of 1.1 KV voltage grade.	Coil(90M)	120M	700-00	934-00
5.	5A,250V Angle holder	No	5 Nos	20-00	100-00
6.	Bulk head fitting complete with glass doom and mesh	set	2 sets	200-00	400-00
7.	5A,250V 2 plate ceiling rose	No	5 Nos	20-00	100-00
8.	5A,250V SP switch	No	14 Nos	25-00	350-00
9.	8 SWG GI wire	kg	1 kg	35-00	35-00
10.	40 mm dia GI pipe with 3mm thickness	M	2.5 M	180-00	450-00
11.	5A 3/2 pin, 250V wall plug socket	No	2 Nos	50-00	100-00
12.	100X100X45mm TW Board	No	2 Nos	15-00	30-00
13.	250X175X45mm TW Board	No	2 Nos	50-00	100-00
14.	100X100X45mm Hylum plate	No	2 Nos	30-00	60-00
15.	250X175X45mm Hylum plate	No	2 Nos	80-00	160-00
16.	30 A flush type fuse unit	No	1 No	30-00	30-00
17.	Miscellaneous materials such as screws, junction boxes, bends etc.	LS			300-00
18.	Labour charges for a) 14 light points @ Rs. 70-00 per point= 980-00 b) Earth work @Rs.200-00 c) Main switch and wiring @ Rs.100-00				
19.	Contingencies @ 5% for unforeseen items and price variation				268.28
				Grand Total Rs.	5634-00

Grand Total is Rs. five thousand six hundred and thirty-four only.

Estimation of cost for heating circuit

Sl.no	Particulars	unit	quantity	Rate in Rs.	Cost in Rs.
1	60A ICDP switch	No	1 No	600-00	600-00
2	20A,240V SP MCB	No	2 No	150-00	300-00
3	20mm PVC pipe. 2mm thick	Length (3M)	21M	50-00	350-00
4	20mm dia PVC bend	No	4 Nos	5-00	20-00
5	6 sq.mm PVC insulated cu cable	Coil(90M)	24m	7000-00	1866.67
6	2.5 sq.mm PVC insulated cu cable	Coil(90M)	19m	3000-00	633.33
7.	8 SWG GI wire	kg	1 kg	35-00	35-00
8.	40mm dia GI pipe	M	2.5M	180-00	450-00
9.	16A,250V SP switch	No	2 Nos	100-00	200-00
10.	16A, 250V wall plug socket	No	2 Nos	150-00	300-00
11	150X150X45mm TW board	No	2 Nos	30-00	60-00
12.	150X150X45mm hylum plate	No	2 Nos	50-00	100-00
13.	300X300X45mm TW board	No	1 No	120-00	120-00
14.	Miscellaneous materials such as bolt, nuts, coal and salt etc.	LS			300-00
15.	Labour charges a) For Heating points @ Rs. 150X2=300 b) For main board wiring @ Rs 150-00 c) For earthing @ 200-00				650-00
16.	Contingencies @ 5%				299.25
				Grand Total Rs.	6284-00

RESULT: Electrical wiring of a residential building drawn and BOM created using CAD tools

Signature of staff

3b.Draw a wiring layout of a small workshop with 3 lathes, 1 drilling machine, 1 welding machine, 1 grinding machine and generate BOM

4a.Draw MCC (Motor Control Centre) Panel board Wiring and create BOM. Date:

AIM: To draw MCC (Motor Control Centre) Panel board Wiring and create BOM using CAD tools.

COMMANDS USED

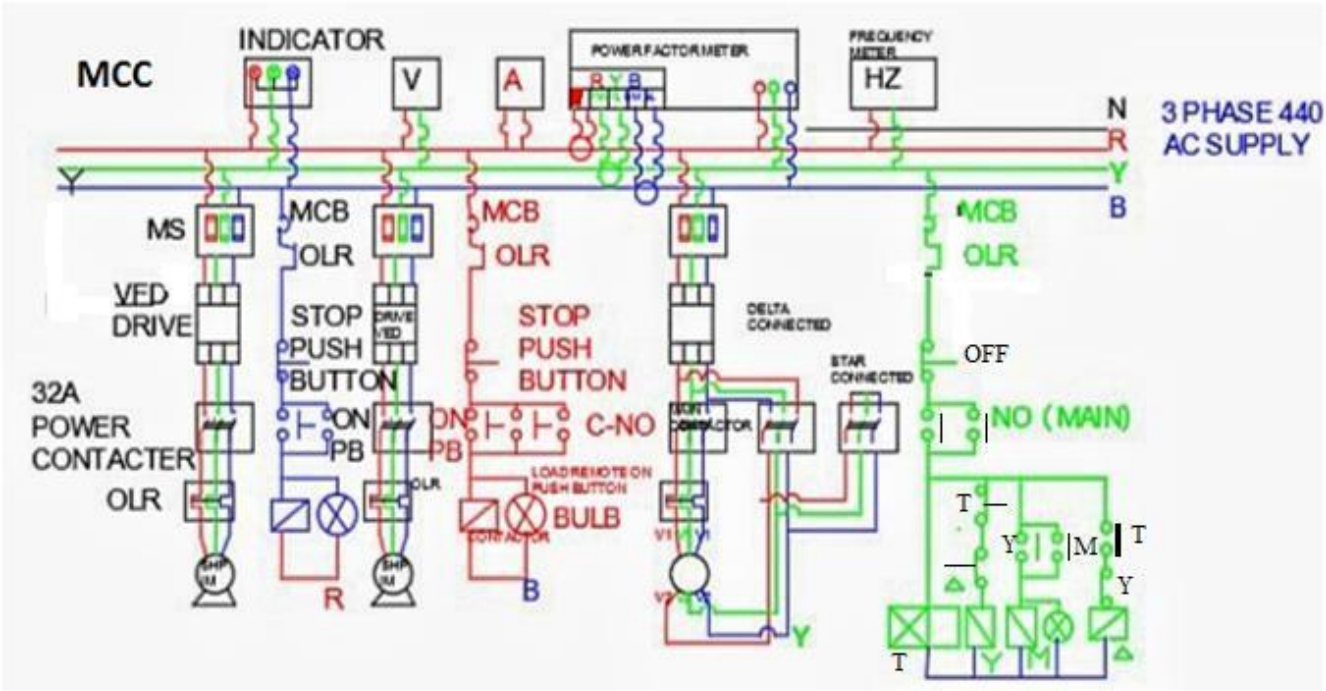
Line, Circle, trim, Copy, Mirror, Fillet, Text, Hatch, rectangle, table, Dimension

HARDWARE AND SOFTWARE REQUIREMENTS

Computer with its accessories
AutoCAD package

PROCEDURE

1. Open AutoCAD from desktop]↵ DRAWING LIMITS [LIMITS →
2. Set the drawing limits by clicking, FORMAT from menu bar and set the required values for both lower and upper limits. ZOOM ALL to get enlarged view.→ ZOOM →
3. Then click on VIEW MENU]↵ A ↵[Z UNITS→
4. Set the units and precision from the format menu by clicking FORMAT] ↵[UN] from the draw toolbar and drawn the horizontal and↵
5. Click on the LINE [L vertical line.
6. To change the properties of LINE Click on line type control from properties toolbar. And click on other .then load the required line type from line type manager. then select the line and change it in to the required line type command from modify toolbar
7. Select CIRCLE [C and enter the radius.] command from the modify toolbar to remove the drawn.↵
8. .Click on the TRIM [TR line at required point.
9. Click on the rectangle command to draw meters
10. Finally the outer dimensions are shown by clicking dimensions from the menu bar and ↵give the required dimensions.[DLI &]↵DCO SAVE→
11. The drawings is saved by clicking FILE



Sl no	Particulars	unit	quantity	rate	amount
1	RYB indicating lamps	nos	3	150	450
2	Analog Ammeter	nos	1	500	500
3	Analog Voltmeter	no	1	500	500
4	100/5A CT	nos	3	500	1500
5	PF meter	no	1	3000	3000
6	32A ICTP	Nos	2	600	600
7	63A ICTP	no	1	1500	1500
8	32A MCB	nos	2	500	1000
9	63A MCB	nos	1	1000	1000
10	VFD Drive	no	1	5000	5000
11	32A power contactor	nos	2	700	1400
12	Overload relay	nos	2	350	700
13	63A power contactor	nos	3	2000	6000
14	Overload relay	no	1	650	650
15	Timer	no	1	250	250
16	Start push button	nos	4	75	300
17	Stop push button	nos	4	75	300
18	Control wiring and wiring materials	lump sum			2000
	TOTAL				66650

Rupees two lakh six thousand six hundred and fifty

RESULT: MCC (Motor Control Centre) Panel board Wiring drawn and BOM created using CAD tools

Signature of staff

5a.Design an Electrical General Assembly of LT panel wiring. Date:

AIM: To draw an Electrical General Assembly of LT panel wiring using CAD tools.

COMMANDS USED

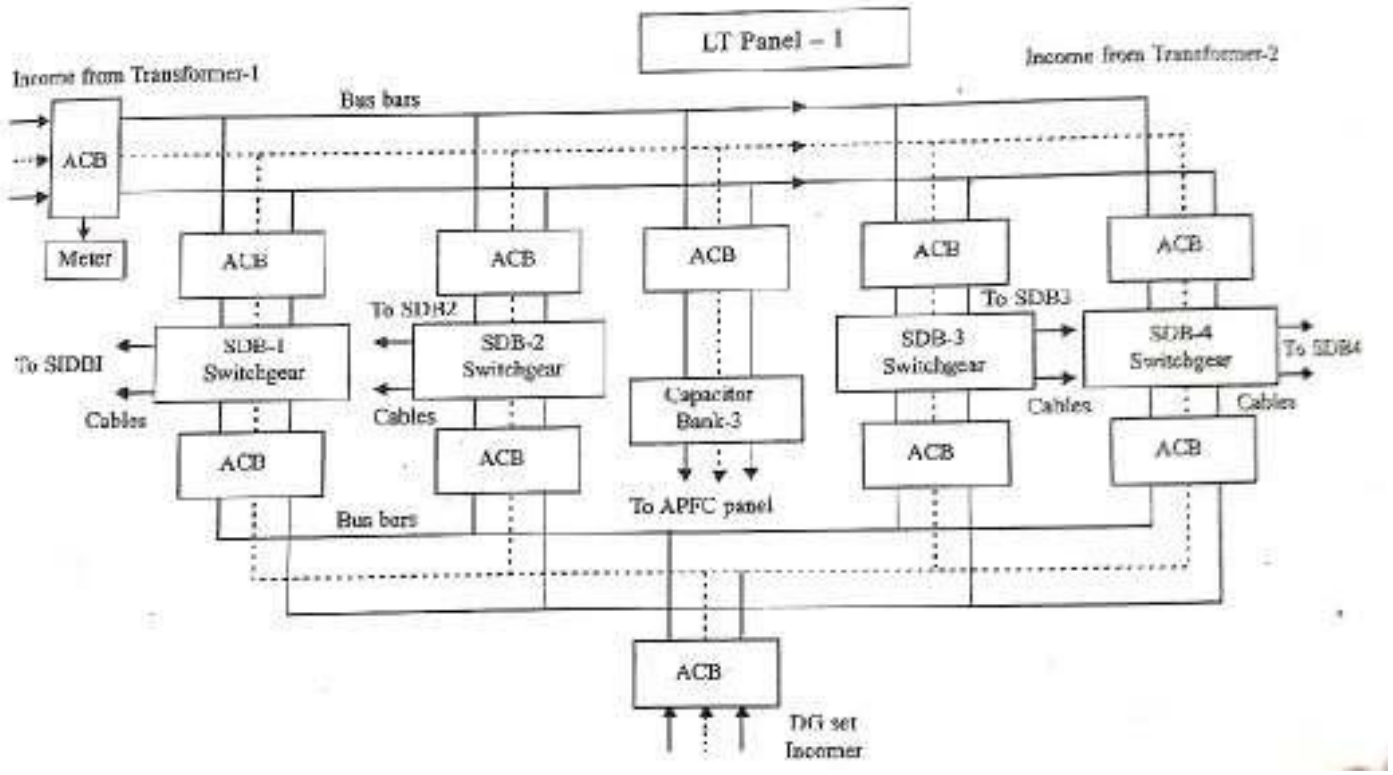
Line, Circle, trim, Copy, Mirror, Fillet, Text, Hatch, rectangle, table, Dimension

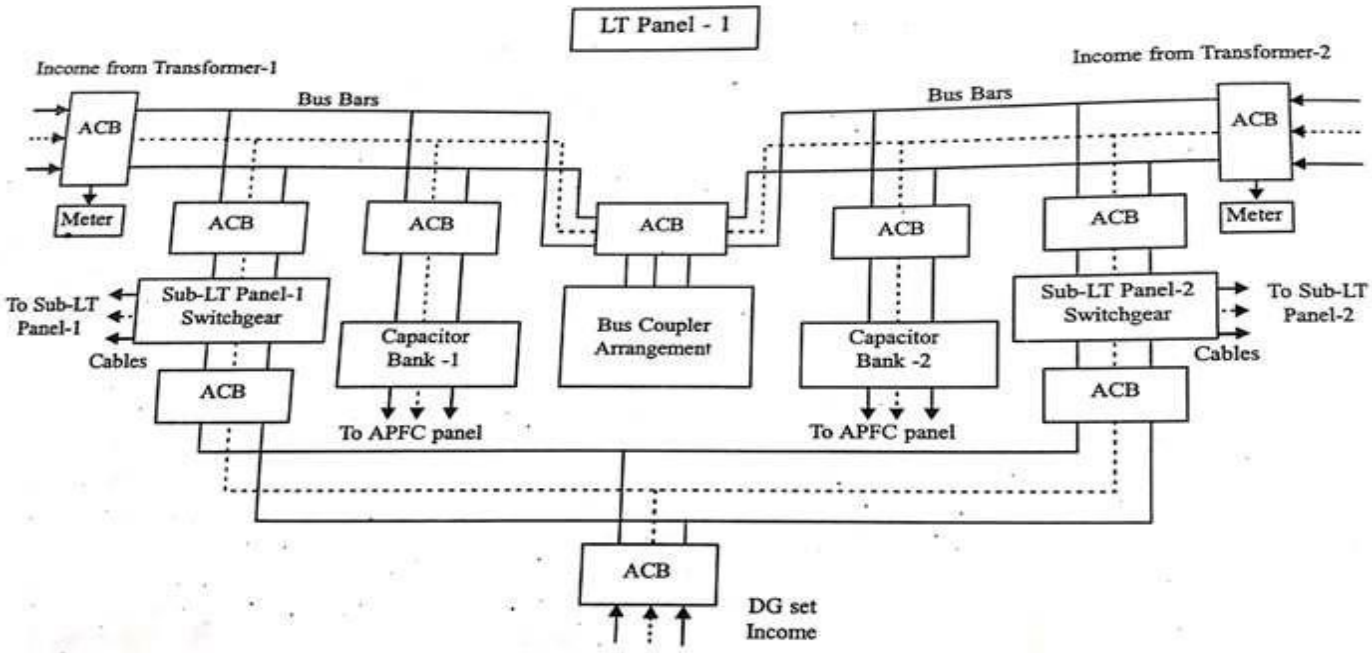
HARDWARE AND SOFTWARE REQUIREMENTS

Computer with its accessories
AutoCAD package

PROCEDURE

1. Open AutoCAD from desktop]↵ DRAWING LIMITS [LIMITS →
2. Set the drawing limits by clicking, FORMAT from menu bar and set the required values for both lower and upper limits. ZOOM ALL to get enlarged view.→ ZOOM →
3. Then click on VIEW MENU]↵ A ↵[Z UNITS→
4. Set the units and precision from the format menu by clicking FORMAT] ↵[UN] from the draw toolbar and drawn the horizontal and↵
5. Click on the LINE [L vertical line.
6. To change the properties of LINE Click on line type control from properties toolbar. And click on other .then load the required line type from line type manager. then select the line and change it in to the required line type command from modify toolbar
7. Select CIRCLE [C and enter the radius.] command from the modify toolbar to remove the drawn↵
8. .Click on the TRIM [TR line at required point.
9. Click on the rectangle command to draw meters
10. Finally the outer dimensions are shown by clicking dimensions from the menu bar and ↵give the required dimensions.[DLI &]↵DCO SAVE→
11. The drawings is saved by clicking FILE





RESULT: An Electrical General Assembly of LT panel wiring is designed using CAD tools.

Signature of staff

6a.Develop a winding diagram- A.C. windings-Single Layer. Date:

AIM: To draw the developed winding diagram of a 3 phase induction motor with 18 slots, 2 poles, single layer, full pitched winding with delta connection.

COMMANDS USED

Line, trim, Copy, Mirror, Text, Hatch, rectangle, table, Dimension, array.

HARDWARE AND SOFTWARE REQUIREMENTS

Computer with its accessories
AutoCAD package

PROCEDURE

1. Open AutoCAD from desktop]↵ DRAWING LIMITS [LIMITS →
2. Set the drawing limits by clicking, FORMAT from menu bar and set the required values for both lower and upper limits. ZOOM ALL to get enlarged view.→ ZOOM →
3. Then click on VIEW MENU]↵ A ↵[Z UNITS→
4. Set the units and precision from the format menu by clicking FORMAT] ↵[UN] from the draw toolbar and drawn the horizontal and↵
5. Click on the LINE [L vertical line.
6. To change the properties of LINE Click on line type control from properties toolbar. And click on other .then load the required line type from line type manager. Then select the line and change it in to the required line type command from modify toolbar

7 .Click on the TRIM [TR line at required point.

8. Click on the rectangle command to draw meters

9. Finally the outer dimensions are shown by clicking dimensions from the menu bar and ↵give the required dimensions.[DLI &]↵DCO SAVE→

10. The drawings is saved by clicking FILE

CALCULATION

No. of slots per pole per phase = 18/(2 x 3) = 3

Pole pitch = no. of conductor / pole = z/p = 18/2 = 9

Slot angle = 180/ pole pitch = 180/9 = 20^0

Full pitched winding = coil span = 180^0

Coil span = winding pitch/slot angle = 180/20 = 9 slots

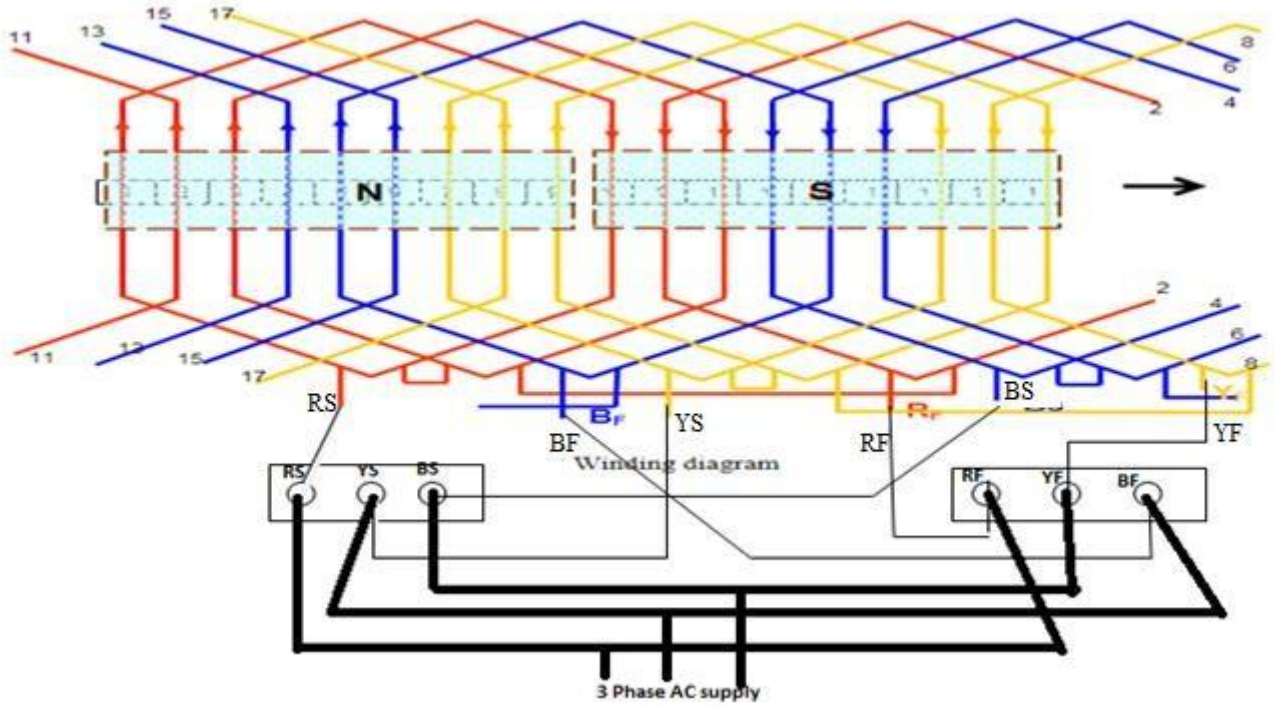
WINDING TABLE

phase	1st pole	2nd pole
R	1+9=10 3+9=12	11+9=20(2)
Y	7+9=16 9+9=18	17+9=26(8)
B	5+9=14	13+9=22(4) 15+9=24(6)

Connections: Rs = 1,

Ys = 1 + 120/slot angle = 1+120/20 = 7;

Bs = 1 + 240/slot angle = 1+ 240/20 = 13



Result: Single Layer winding diagram of a 3 phase induction motor with 18 slots, 2 poles, single layer, full Pitched winding with delta connection is drawn using CAD. Signature of staff

6b.Develop a winding diagram- A.C. windings- Double Layer, Design and draw the developed winding diagram of a n AC motor with following details: No of poles = 4, no. of phases = 3, No. of conductors = 24, double layer lap winding, star connected. Date:

AIM: To develop and draw winding diagram of a n AC motor with following details: No of poles = 4, no. of phases = 3, No. of conductors = 24, double layer wave winding, star connected.

COMMANDS USED: Line, Trim, Offset, Copy, Move, Fillet, Text, Hatch, Array

PROCEDURE

1. Open AutoCAD from desktop]↵ DRAWING LIMITS [LIMITS →
2. Set the drawing limits by clicking, FORMAT from menu bar. and set the required values for both lower and upper limits. ZOOM ALL to get enlarged view.→ ZOOM →
3. Then click on VIEW MENU]↵ A ↵[Z UNITS→
4. Set the units and precision from the format menu by clicking FORMAT] ↵[UN] from the draw toolbar and drawn the horizontal and↵
5. Click on the LINE [L vertical line.
6. To change the properties of LINE Click on line type control from properties toolbar. And click on other .then load the required line type from line type manger.then select the line and change it in to the required line type. Command from modify toolbar and enter the offset↵
7. Click on the OFFSET [O distance, press enter key and select the object.] command from the modify toolbar to remove the drawn↵
8. Click on the TRIM [TR line at required point.] command from the modify toolbar, enter the value
9. Then click on FILLET [F radius and select the object to be joined.]↵], MOVE [M ↵
11. Then by clicking on COPY [CO &]↵ROTATE [RO commands from the modify toolbar, at required places.] command from the modify toolbar and select↵
12. Then click on ARRAY [AR rectangular array. Then select the object, pick the raw and column offset distane and enter the no of items in the array dialog box.] from the draw toolbar for the shading the required areas
13. Select HATCH [H suitable scale.]↵
14. The related details on the drawings are mentioned by clicking the TEXT [T Mtext from the draw toolbar.
15. Finally the outer dimensions are shown by clicking dimensions from the menu bar ↵and give the required dimensions.[DLI &]↵DCO SAVE→
16. The drawings is saved by clicking FILE

SOLUTION

No. of poles = 4; No. of conductors = 24; no of slots z= 12

Pole pitch z/p =12/4 = 3; no of slots/pole /phase = 12 / (4x3) = 1

Slot angle = 180/pole pitch = 180/3 = 60^0

Winding pitch = 180

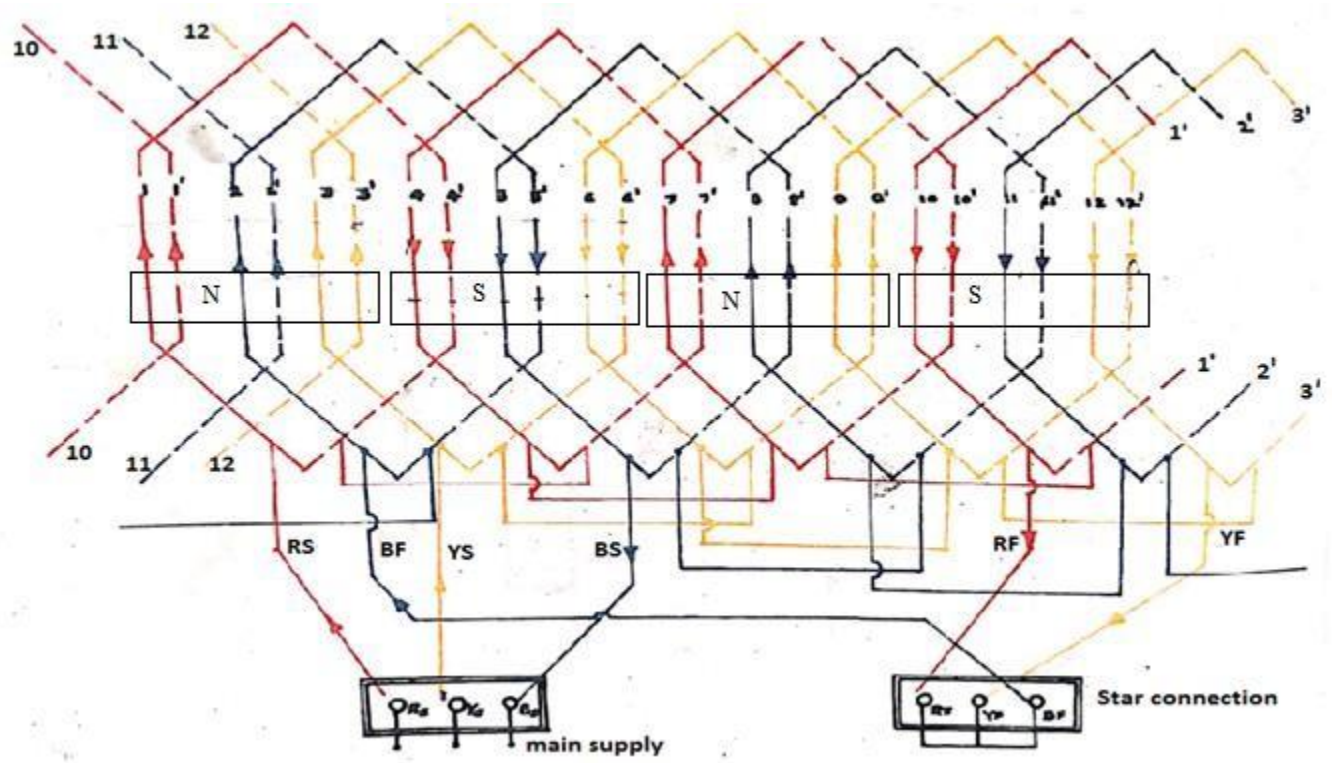
Hence coil span = winding pitch/slot angle 180^0 / 60 = 3

Connections: Rs = 1, Ys = 1 + 120/60 = 3; Bs = 1 + 240/60 = 5

Winding table

R PHASE	Y PHASE	B PHASE
1+3=4'	3+3=6'	5+3=8'
4+3=7'	6+3=9'	8+3=11'
7+3=10'	9+3=12'	11+3=14(2')
10+3=13(1')	12+3=15(3')	2+3=5'

Winding Diagram



Result: The winding diagram of a n AC motor with No of poles = 4, no. of phases = 3, No. of conductors = 24, double layer lap winding, star connected is drawn using CAD.

Signature of staff

7. Develop a winding diagram for a 1-ph, Induction Motor make terminal connections for Running & Starting Winding. Date:

AIM: To develop a winding diagram for a 1-ph, Induction Motor makes terminal connections for Running & Starting Winding.

COMMANDS USED: Line, Trim, Offset, Copy, Move, Text, Array

PROCEDURE

1. Open AutoCAD from desktop]↵ DRAWING LIMITS [LIMITS →
2. Set the drawing limits by clicking, FORMAT from menu bar and set the required values for both lower and upper limits. ZOOM ALL to get enlarged view.→ ZOOM →
3. Then click on VIEW MENU]↵ A ↵[Z UNITS→
4. Set the units and precision from the format menu by clicking FORMAT] ↵[UN] from the draw toolbar and drawn the horizontal and↵
5. Click on the LINE [L vertical line.
6. To change the properties of LINE Click on line type control from properties toolbar. And click on other .then load the required line type from line type manager. Then select the line and change it in to the required line type. Command from modify toolbar and enter the offset↵
7. Click on the OFFSET [O distance, press enter key and select the object.] command from the modify toolbar to remove the drawn↵
8. Click on the TRIM [TR line at required point.] command from the modify toolbar, enter the value of↵
9. Then by clicking on COPY [CO &]↵ROTATE [RO commands from the modify toolbar, at required places.] command from the modify toolbar and select↵
10. The related details on the drawings are mentioned by clicking the TEXT [T Mtext from the draw toolbar.
11. Finally the outer dimensions are shown by clicking dimensions from the menu bar ↵and give the required dimensions.[DLI &]↵DCO SAVE→
12. The drawings is saved by clicking FILE

CALCULATION

No of slots=24, no of conductor z=24

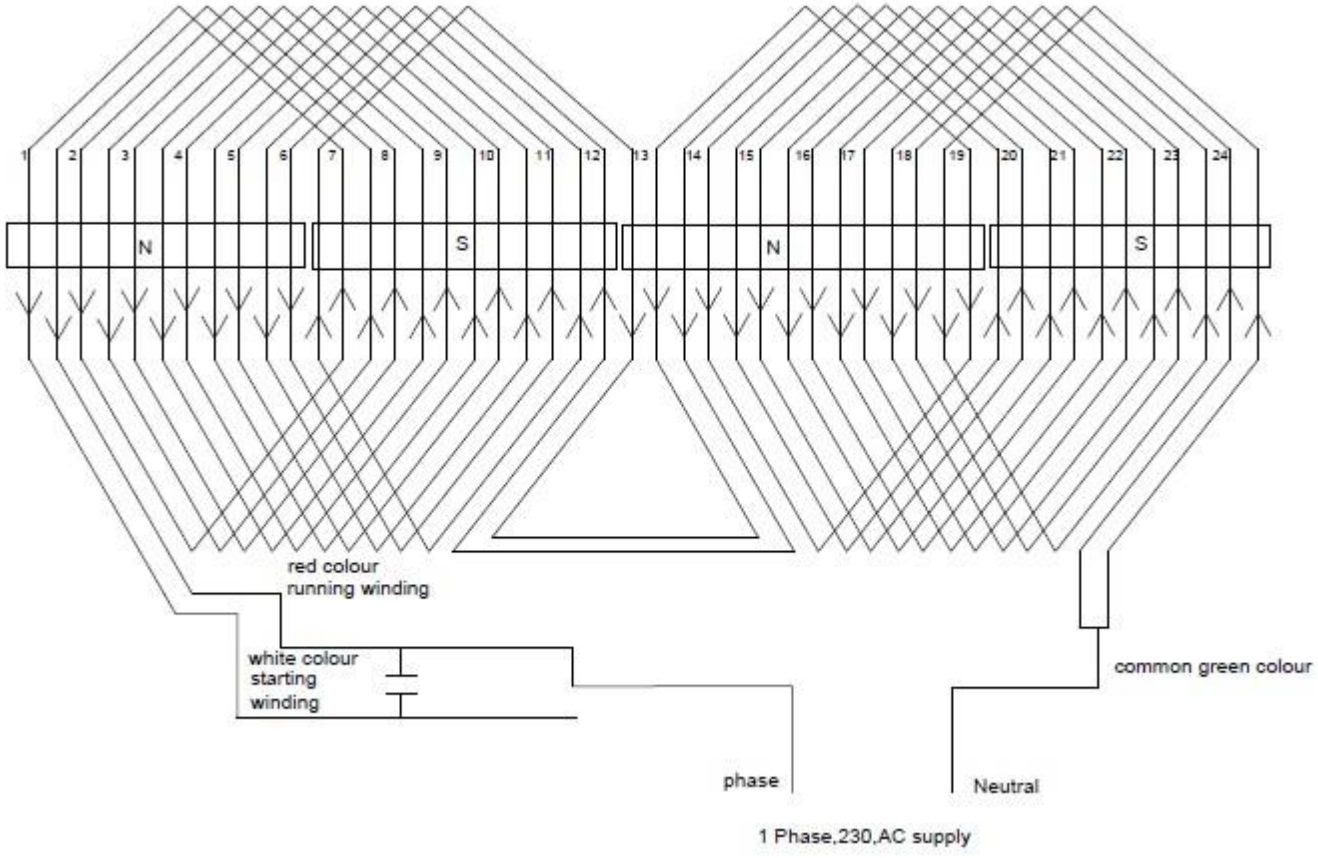
Pole pitch= total no of slots /no of poles =24/4=6

Yb= 6 Yf+1=Yb Yf=6-1=5

WINDING TABLE

S no	Back pitch YB=6	Front pitch YF=5
1	1+6=7	7-5=2
2	2+6=8	8-5=3
3	3+6=9	9-5=4
4	4+6=10	10-5=5
5	5+6=11	11-5=6
6	6+6=12	12+1=13
7	13+6=19	19-5=14
8	14+6=20	20-5=15
9	15+6=21	21-5=16
10	16+6=22	22-5=17
11	17+6=23	23-5=18
12	18+6=24	

Winding Diagram



RESULT: winding diagram for a 1-ph, Induction Motor with terminal connections for Running & Starting Winding is developed

Signature of staff

DC LAP WINDING

A lap winding is a winding in which successive coils overlap each other. It is named a <Lap= winding because it doubles or laps back with its succeeding coils.

Draw the winding diagram of a D C Machine with 4 poles, 14 slots, progressive, double layer lap Winding. Show the position of brushes and direction of induced emf. Date:

AIM: To Draw the winding diagram of a D C Machine with 4 poles, 14 slots, progressive, double layer lap Winding. Show the position of brushes and direction of induced emf.

COMMANDS USED: Line, Trim, Offset, Copy, Move, Text, Hatch, Array

Calculation

Number of poles = 4 ; Number of slots = 14, Number of conductors = 14 x 2 = 28

Pole pitch = Number of conductors/pole z/p = 28/4 = 7

Pole pitch = $(Y_b + Y_f) / 2 = Y_p$

Yb + Yf) = 14

(Yb - Yf) = 2

Solving above equations Yb = 8 and Yf = 6

For lap winding both Yb and Yf must be odd and differ by 2

Satisfying the above condition Yb = 7 and Yf = 5 (Winding diagram and ring diagrams are shown below)

Winding Table:

At the back $Y_b = 7$ coil side → connected to coil side	At the front $Y_f = 5$ coil side → connected to coil side	At the back $Y_b = 7$ coil side → connected to coil side	At the front $Y_f = 5$ coil side → connected to coil side
1+7 = 8 3+7 = 10 5+7 = 12 7+7 = 14 9+7 = 16 11+7 = 18 13+7 = 20 15+7 = 22	8 – 5 = 3 10 – 5 = 5 12 – 5 = 7 14 – 5 = 9 16 – 5 = 11 18 – 5 = 13 20 – 5 = 15 22 – 5 = 17	17 +7 = 24 19+7 = 26 21+7 = 28 23+7 = 30 (2) 25+7 = 32 (4) 27+7 = 34 (6)	24 – 5 = 19 26 – 5 = 21 28 – 5 = 23 30 – 5 = 25 32 – 5 = 27 34– 5 = 29 (1)

PROCEDURE:

1. Open **AutoCAD** from desktop

2. Set the drawing limits by clicking, **FORMAT - DRAWING LIMITS [LIMITS]** from menu bar and set the required values for both lower and upper limits.

3. Then click on **VIEW MENU - ZOOM - ZOOM ALL** to get enlarged view.

4. Set the units and precision from the format menu by clicking **FORMAT - UNITS**

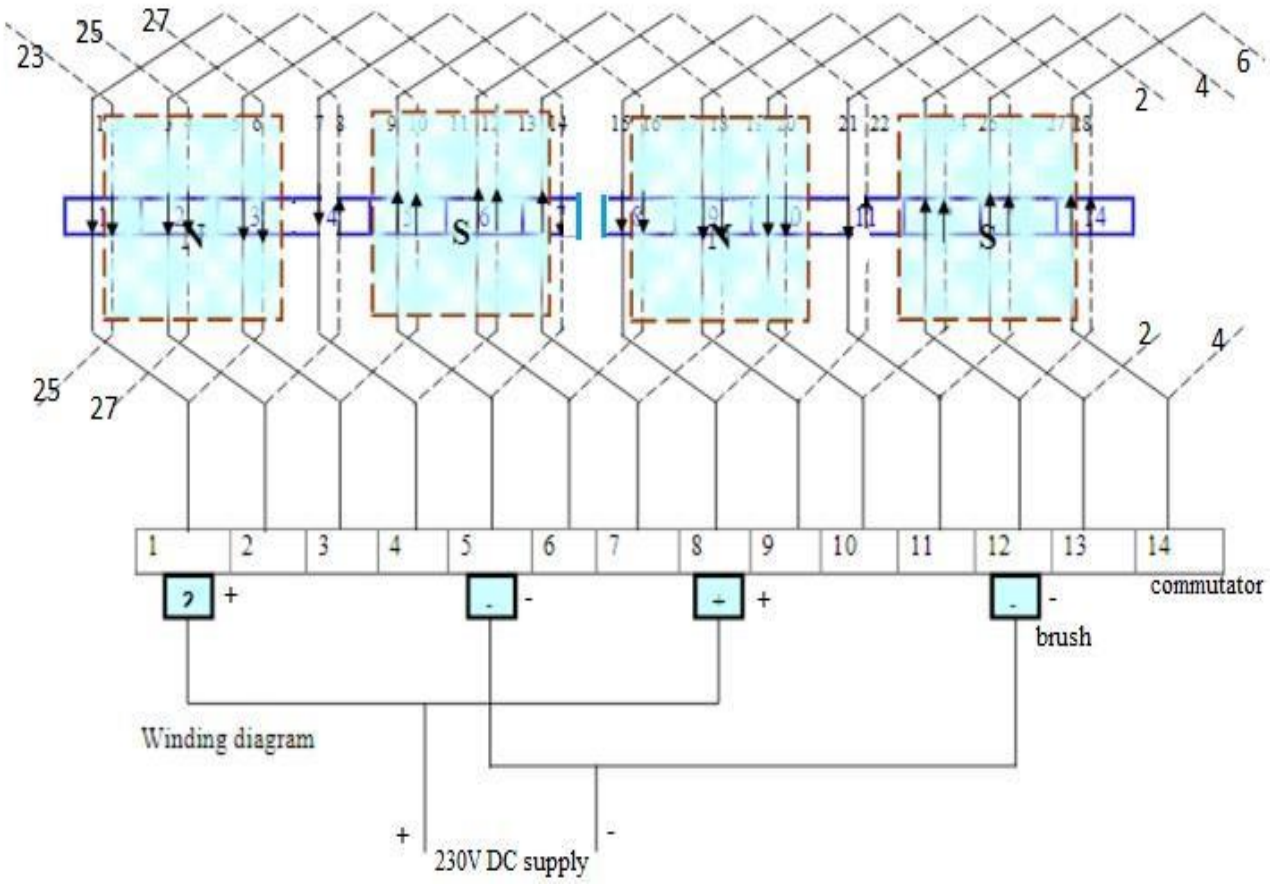
5. Click on the **LINE** from the draw toolbar and drawn the horizontal and vertical line.

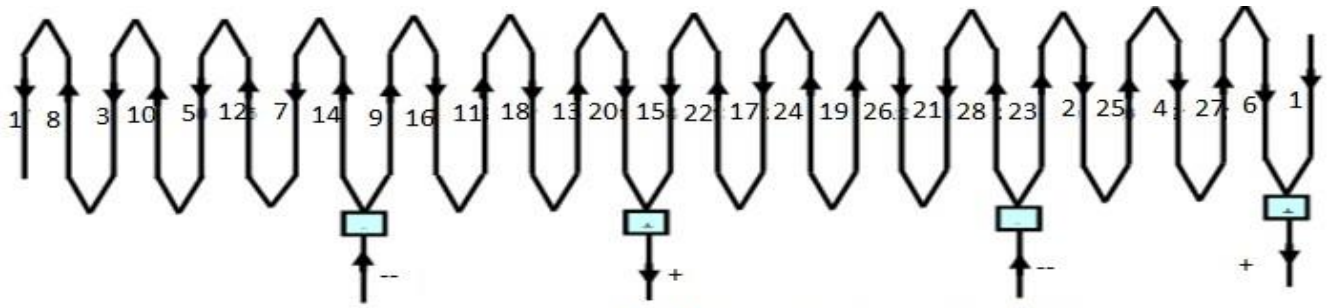
6. To change the properties of **LINE**-Click on **line type control** from **properties** toolbar. And click on **other** .then load the required line type from **line type manger.** Then select the line and change it in to the required line type.

7. Click on the **OFFSET [O]** command from modify toolbar and enter the offset distance, press enter key and select the object.

8. Click on the **TRIM [TR**] command from the modify toolbar to remove the drawn line at required point.
9. Then by clicking on **COPY [CO] ,MOVE [M] & ROTATE [RO]** commands from the modify toolbar, at required places.
10. Then click on **ARRAY [AR]** command from the modify toolbar and select rectangular array. Then select the object, pick the raw and column offset distance and enter the no of items in the array dialog box.
11. Select **HATCH [H]** from the draw toolbar for the shading the required areas at suitable scale.
12. The related details on the drawings are mentioned by clicking the **TEXT [T] Mtext** from the draw toolbar.
13. Finally the outer dimensions are shown by clicking dimensions from the menu bar and give the required dimensions.**[DLI& DCO]**
14. The drawings is saved by clicking **FILE** &**SAVE**

Winding Diagram





Ring diagram **or** sequence diagram

RESULT: the winding diagram of a D C Machine with 4 poles, 14 slots, progressive, double layer lap Winding is drawn and the position of brushes , direction of induced emf is shown

Signature of staff

8. Three-phase core type 200KVA 33KV/400V transformer front elevation full in section, plan in full section. Date:

DIMENSION

Dimension of various parts are given core
Cross section of the core = 2 stepped core
Radius of circumscribing circle=13cm
Distance between adjacent core centres=52cm
Yoke
Height of the yoke=10cm

LV winding

Outer radius of LV coil=14.75cm
Inner radius of LV coil =13cm
Height of LV winding=42.5cm
Number of turns per phase=61

HV winding

Outer radius of HV1 coil=19cm
Inner radius of HV1 coil=17cm
Outer radius of HV2 coil =24cm
Inner radius of HV2 coil=21cm
Height of HV winding=42.5cm
Number of turns per phase=76
Total height of the transformer is 66.5cm.assume any data missing

STAMPING

a=0.85Xd (Long stamping) b=0.53xD (short stamping)
a=0.85x130 = 110.5mm b=0.53x130=68.9mmn

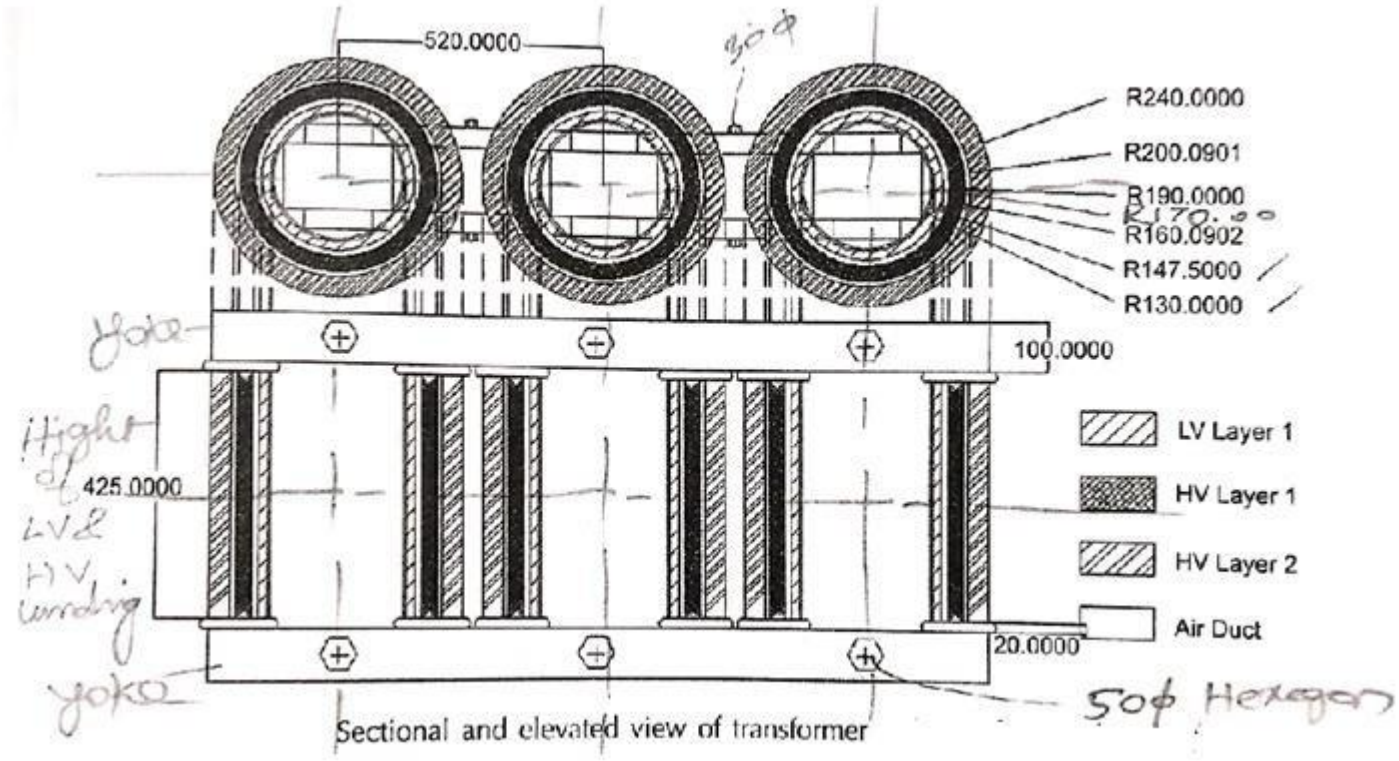
AIM: To draw Three-phase core type 200KVA 33KV/400V transformer front elevation full in section, plan in full section.

COMMANDS USED:- Line , Trim, Offset ,Copy , Move , Fillet , Text , Hatch .

PROCEDURE

1. Open **AutoCAD** from desktop
2. Set the drawing limits by clicking, **FORMAT - DRAWING LIMITS [LIMITS]** from menu bar and set the required values for both lower and upper limits.
3. Then click on **VIEW MENU - ZOOM - ZOOM ALL** to get enlarged view.
4. Set the units and precision from the format menu by clicking **FORMAT - UNITS**
5. Click on the **LINE** from the draw toolbar and drawn the horizontal and vertical line.
6. To change the properties of **LINE-**Click on **line type control** from **properties** toolbar. And click on **other** .then load the required line type from **line type manger.** Then select the line and change it in to the required line type.
7. Click on the **TRIM [TR**] command from the modify toolbar to remove the drawn line at required point.
8. Then click on **FILLET [F**] command from the modify toolbar, enter the value of radius and select the object to be joined.
9. Then by clicking on **COPY [CO] ,MOVE [M] & ROTATE [RO]** commands from the modify toolbar, at required places.
10. Select **HATCH [H]** from the draw toolbar for the shading the required areas at suitable scale.
11. The related details on the drawings are mentioned by clicking the **TEXT [T] Mtext** from the draw toolbar.
12. Finally the outer dimensions are shown by clicking dimensions from the menu bar and give the required dimensions.**[DLI& DCO]**
13. The drawings is saved by clicking **FILE** &**SAVE**

SOLUTION

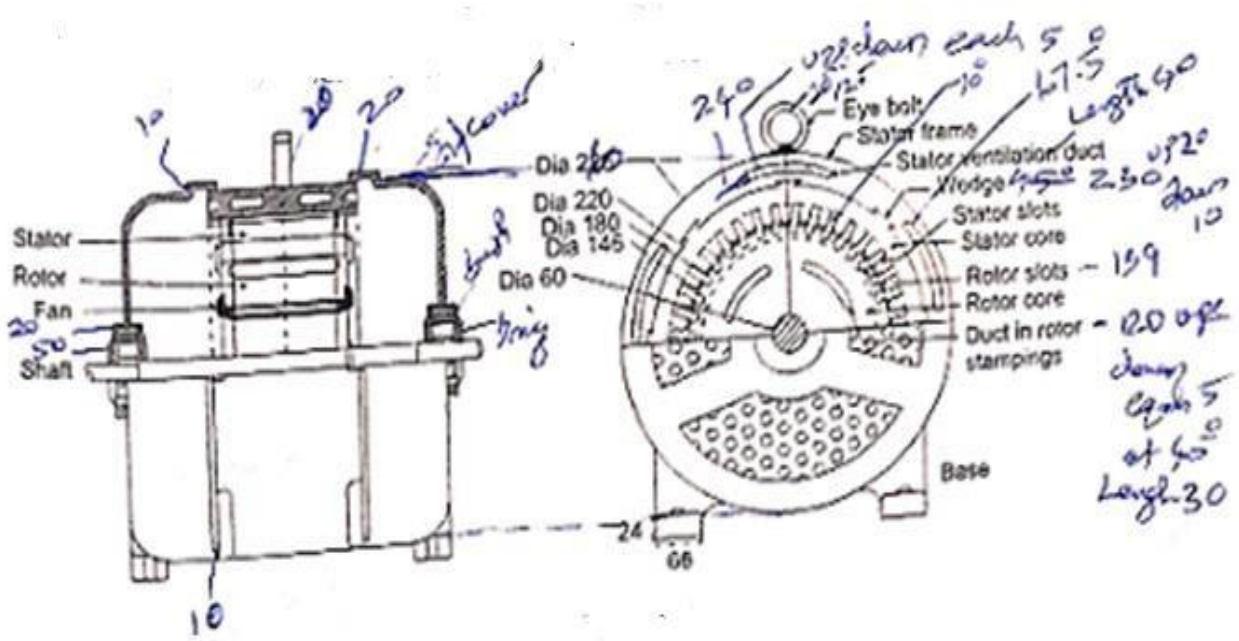


RESULT: the Three-phase core type 200KVA 33KV/400V transformer front elevation full in section, plan in full section is drawn using CAD

Signature of staff

9. Assembly drawing- Squirrel cage Induction motor. Draw the half end view and half sectional front elevation and half sectional end view for a 3HP 400V, 50HZ 3PH 1440 RPM – Squirrel cage Induction motor. Date:

The main dimensions are given
Outer diameter of the stator stamping=20cm
Inside diameter of the stator stamping=16cm
Stator core length=10cm
Thickness of the stator frame =2.5cm
No of slots=36, size=12mmx8mm, air gap=7mm
Outer diameter of the rotor stamping=14.6cm
Inside diameter of the rotor stamping=6cm
No of rotor slots=36
Shaft diameter=4cm



AIM: To Draw the half end view and half sectional front elevation and half sectional end view for a 3HP 400V, 50HZ 3PH 1440 RPM – Squirrel cage Induction motor.

COMMANDS USED: Line, Trim, Copy, Move, Fillet, Text, Hatch.

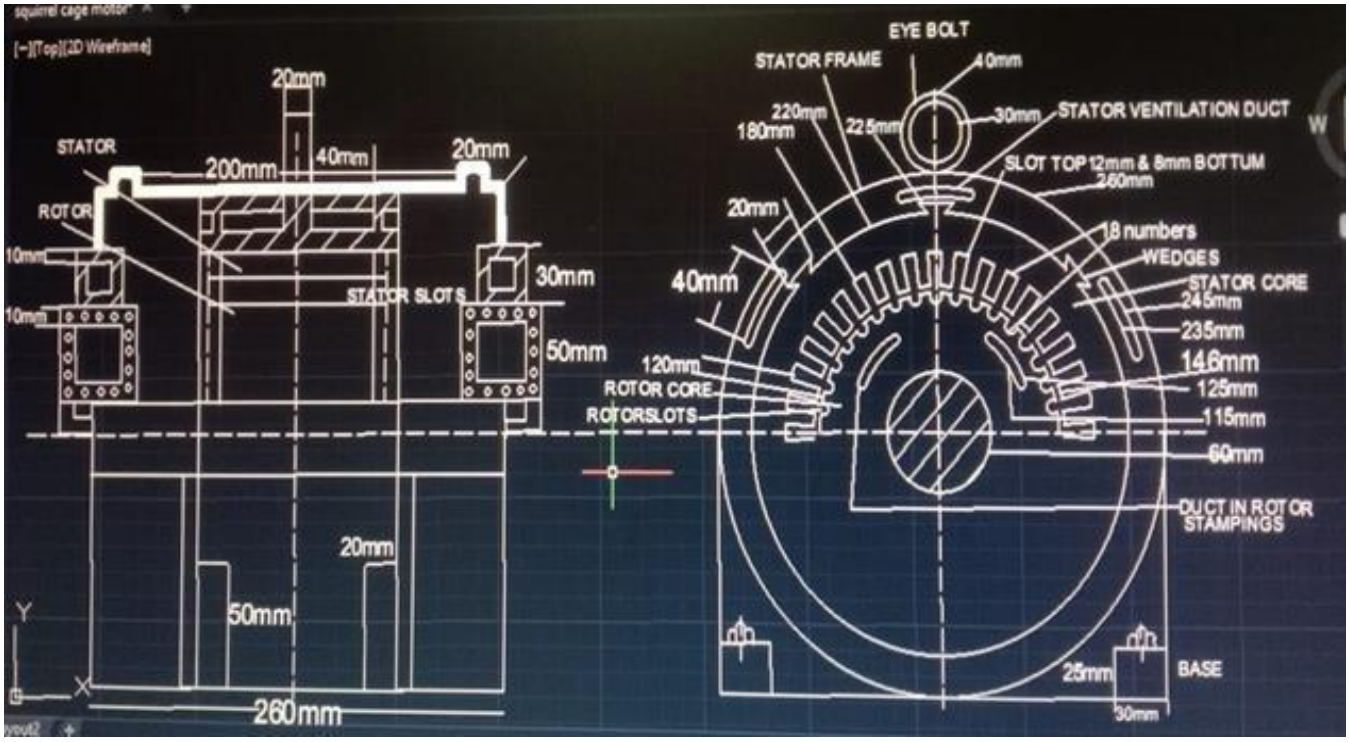
PROCEDURE

1. Open **AutoCAD** from desktop

2. Set the drawing limits by clicking, **FORMAT - DRAWING LIMITS [LIMITS]** from menu bar and set the required values for both lower and upper limits.

3. Then click on **VIEW MENU - ZOOM - ZOOM ALL** to get enlarged view.
4. Set the units and precision from the format menu by clicking **FORMAT - UNITS**
5. Click on the **LINE** from the draw toolbar and drawn the horizontal and vertical line.
6. To change the properties of **LINE**-Click on **line type control** from **properties** toolbar. And click on **other** .then load the required line type from **line type manger.** Then select the line and change it in to the required line type.
7. Click on the **TRIM [TR**] command from the modify toolbar to remove the drawn line at required point.
8. Then click on **FILLET [F**] command from the modify toolbar, enter the value of radius and select the object to be joined.
9. Then by clicking on **COPY [CO] ,MOVE [M] & ROTATE [RO]** commands from the modify toolbar, at required places.
10. Select **HATCH [H]** from the draw toolbar for the shading the required areas at suitable scale.
11. The related details on the drawings are mentioned by clicking the **TEXT [T] Mtext** from the draw toolbar.
12. Finally the outer dimensions are shown by clicking dimensions from the menu bar and give the required dimensions.**[DLI& DCO]**
13. The drawings is saved by clicking **FILE &SAVE**

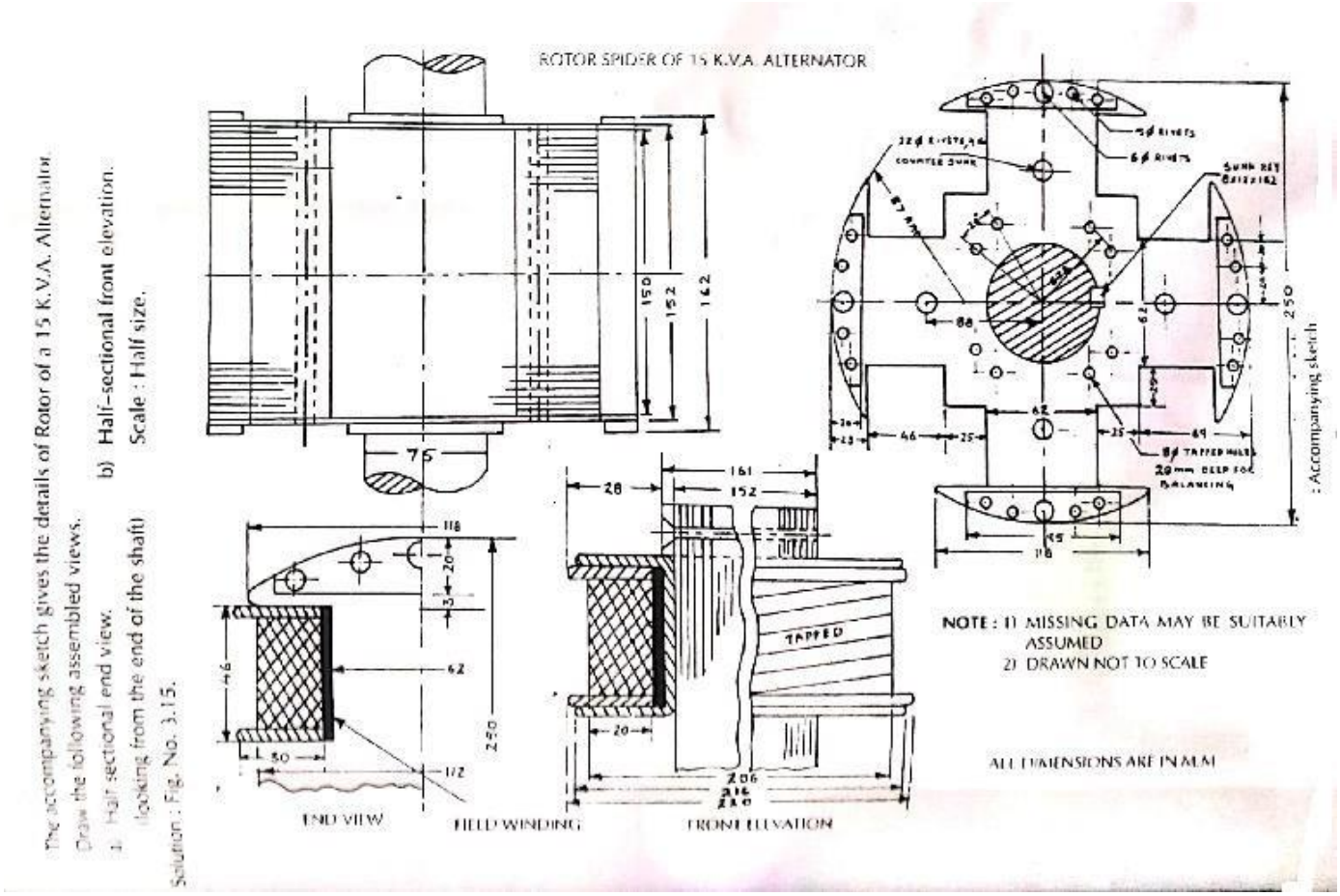
Solution



RESULT: the half end view and half sectional front elevation of 3HP 400V, 50HZ 3PH 1440 RPM for Squirrel cage Induction motor is drawn using CAD

Signature of student

10. Assembly drawing- Rotor of a 15KVA Alternator .Draw the half sectional end view top half in section and half sectional front elevation for a Rotor of a 15KVA Alternator for a given sketch. Date:



AIM: To draw the half end view and half sectional front elevation view for a Rotor of 15KVA Alternator for a given sketch.

COMMANDS USED: Line, Trim, Copy, Move, Fillet, Text, Hatch.

PROCEDURE

1. Open **AutoCAD** from desktop

2. Set the drawing limits by clicking, **FORMAT - DRAWING LIMITS [LIMITS]** from menu bar and set the required values for both lower and upper limits.

3. Then click on **VIEW MENU - ZOOM - ZOOM ALL** to get enlarged view.
4. Set the units and precision from the format menu by clicking **FORMAT - UNITS**
5. Click on the **LINE** from the draw toolbar and drawn the horizontal and vertical line.
6. To change the properties of **LINE**-Click on **line type control** from **properties** toolbar. And click on **other** .then load the required line type from **line type manger.** Then select the line and change it in to the required line type.
7. Click on the **TRIM [TR**] command from the modify toolbar to remove the drawn line at required point.
8. Then click on **FILLET [F**] command from the modify toolbar, enter the value of radius and select the object to be joined.

9. Then by clicking on **COPY [CO] ,MOVE [M] & ROTATE [RO]** commands from the modify toolbar, at required places.

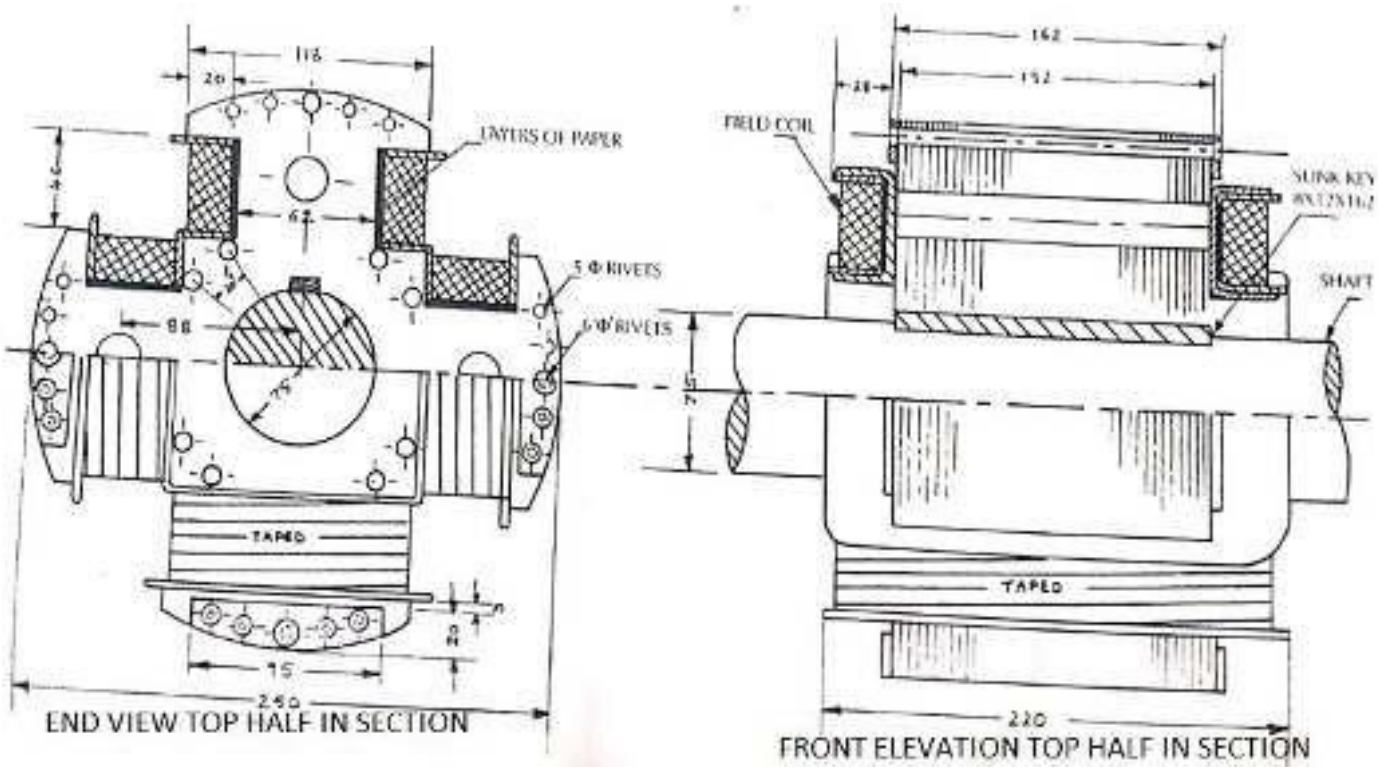
10. Select **HATCH [H]** from the draw toolbar for the shading the required areas at suitable scale.

11. The related details on the drawings are mentioned by clicking the **TEXT [T] Mtext** from the draw toolbar.

12. Finally the outer dimensions are shown by clicking dimensions from the menu bar and give the required dimensions.**[DLI& DCO]**

13. The drawings is saved by clicking **FILE** &**SAVE**

SOLUTION



RESULT: the half end view and half sectional front elevation of a Rotor of 15KVA Alternator for a given sketch is drawn using CAD

Signature of student

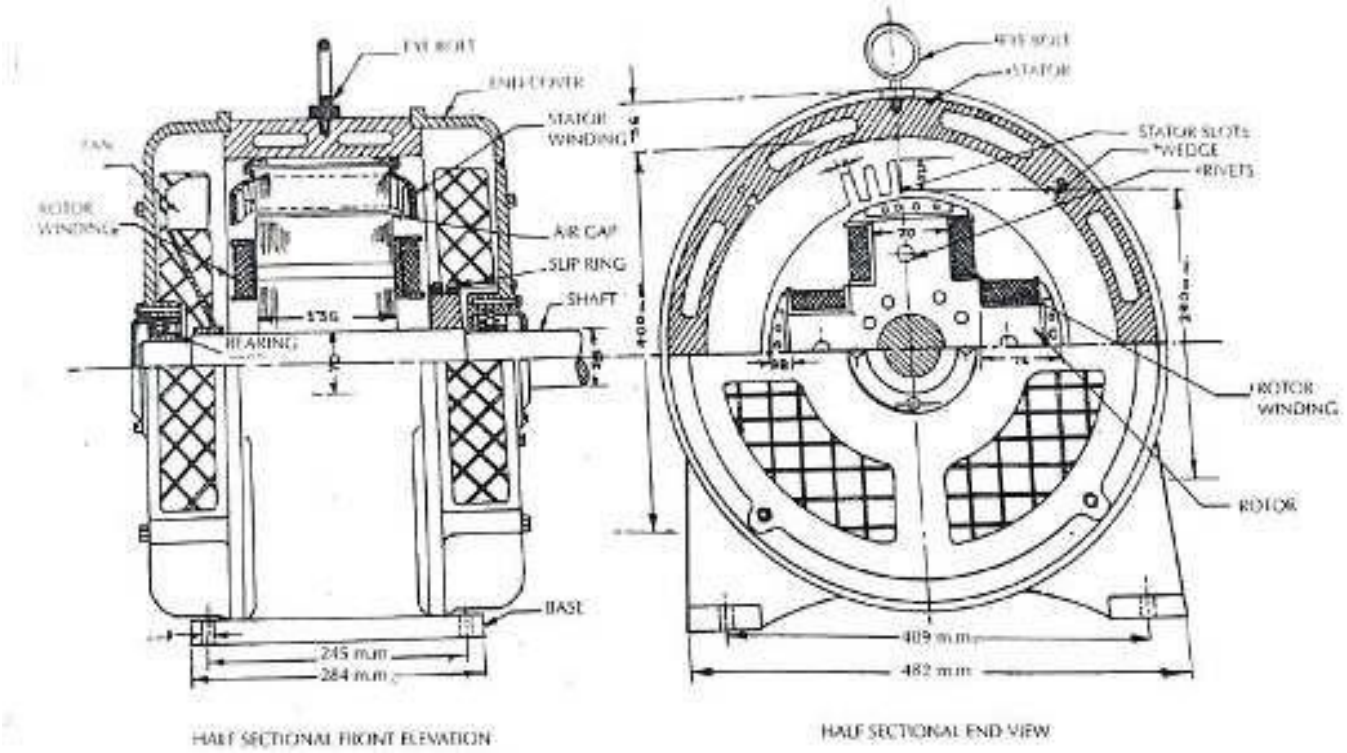
11. Assembly drawing – 4 Pole 25 KVA synchronous motor - Draw half size half sectional elevation and half sectional end view. Date:

Following are the details of 25 KVA, 4 pole synchronous motor. Draw to half size.

1. Half sectional elevation, showing top half in section.
2. Half sectional end view showing top half in section.

1. Outer diameter of the stator stamping	= 400 mm	8. Axial length of the pole	= 135 mm
2. Inner diameter of the stator stamping	= 290 mm	9. Width of the pole	= 70 mm
3. Stator frame thickness	= 36 mm	10. Height of pole with shoe	= 75 mm
4. Axial length of the stator core	= 135 mm	11. Height of shoe	= 13 mm
5. Slots open type number	= 48	12. Diameter of shaft at the centre	= 70 mm
6. Size of the slot	= 32 mm×12 mm	13. Diameter of shaft at the bearing	= 55 mm
7. Air gap	= 2mm		

SOLUTION



AIM: To draw half sectional elevation and half sectional end view of 4 Pole 25 KVA synchronous motor using CAD.

COMMANDS USED: Line, Trim, Copy, Move, Fillet, Text, Hatch

PROCEDURE

1. Open **AutoCAD** from desktop

2. Set the drawing limits by clicking, **FORMAT - DRAWING LIMITS [LIMITS]** from menu bar and set the required values for both lower and upper limits.

3. Then click on **VIEW MENU - ZOOM - ZOOM ALL** to get enlarged view.
4. Set the units and precision from the format menu by clicking **FORMAT - UNITS**
5. Click on the **LINE** from the draw toolbar and drawn the horizontal and vertical line.
6. To change the properties of **LINE-**Click on **line type control** from **properties** toolbar. And click on **other** .then load the required line type from **line type manger.** Then select the line and change it in to the required line type.
7. Click on the **TRIM [TR**] command from the modify toolbar to remove the drawn line at required point.
8. Then click on **FILLET [F**] command from the modify toolbar, enter the value of radius and select the object to be joined.
9. Then by clicking on **COPY [CO] ,MOVE [M] & ROTATE [RO]** commands from the modify toolbar, at required places.
10. Select **HATCH [H]** from the draw toolbar for the shading the required areas at suitable scale.
11. The related details on the drawings are mentioned by clicking the **TEXT [T] Mtext** from the draw toolbar.
12. Finally the outer dimensions are shown by clicking dimensions from the menu bar and give the required dimensions.**[DLI& DCO]**
13. The drawings is saved by clicking **FILE** &**SAVE**

RESULT: the half end view and half sectional front elevation of a 4 Pole 25 KVA synchronous motor is drawn using CAD

Signature of student

12. 3D Drawing- Squirrel cage Induction motor - 3D view showing different parts.

Date:

AIM: To draw the 3D Drawing of Squirrel cage Induction motor showing different parts.

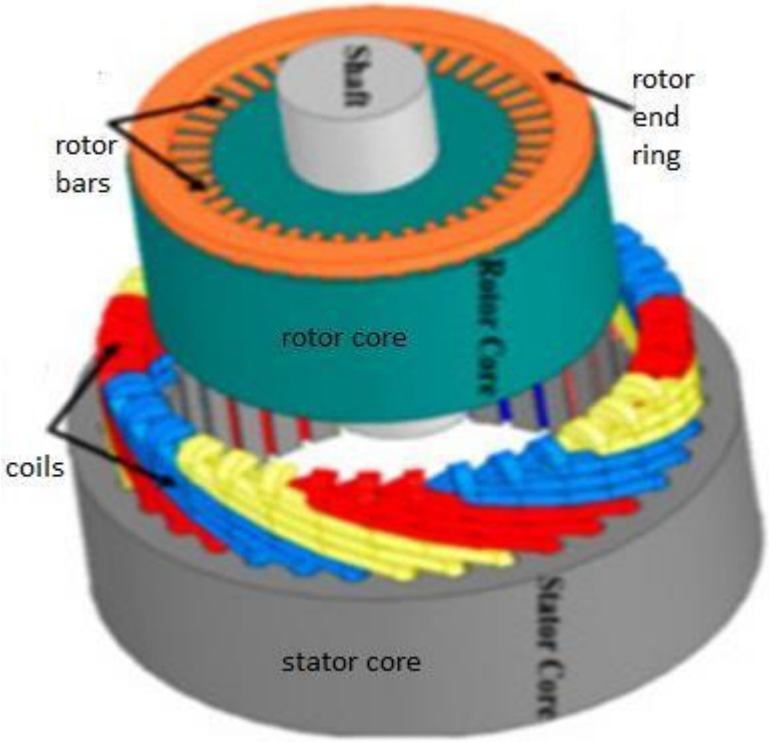
COMMANDS USED: Line, Trim, Copy, Move, Fillet, Text, Hatch, block, extrude

PROCEDURE
1. Open **AutoCAD** from desktop

2. Set the drawing limits by clicking, **FORMAT - DRAWING LIMITS [LIMITS]** from menu bar and set the required values for both lower and upper limits.

3. Then click on **VIEW MENU - ZOOM - ZOOM ALL** to get enlarged view.
4. Set the units and precision from the format menu by clicking **FORMAT - UNITS**
5. Click on the **LINE** from the draw toolbar and drawn the horizontal and vertical line.
6. To change the properties of **LINE-**Click on **line type control** from **properties** toolbar. And click on **other** .then load the required line type from **line type manger.** Then select the line and change it in to the required line type.

7. Click on the **TRIM [TR**] command from the modify toolbar to remove the drawn line at required point.
8. Then click on **FILLET [F**] command from the modify toolbar, enter the value of radius and select the object to be joined.
9. Then by clicking on **COPY [CO] ,MOVE [M] & ROTATE [RO]** commands from the modify toolbar, at required places.
10. Select **HATCH [H]** from the draw toolbar for the shading the required areas at suitable scale.
11. The related details on the drawings are mentioned by clicking the **TEXT [T] Mtext** from the draw toolbar.
12. Finally the outer dimensions are shown by clicking dimensions from the menu bar and give the required dimensions.**[DLI& DCO]**
13. 3D drawing is drawn using extrude, block command
14. The drawings is saved by clicking **FILE** &**SAVE**



RESULT: the3D Drawing of Squirrel cage Induction motor with different part is drawn using CAD

Signature of student

13. PLC Module - Design a Simple PLC Module showing I/O points. Date:

AIM: To draw a Simple PLC Module showing I/O points.

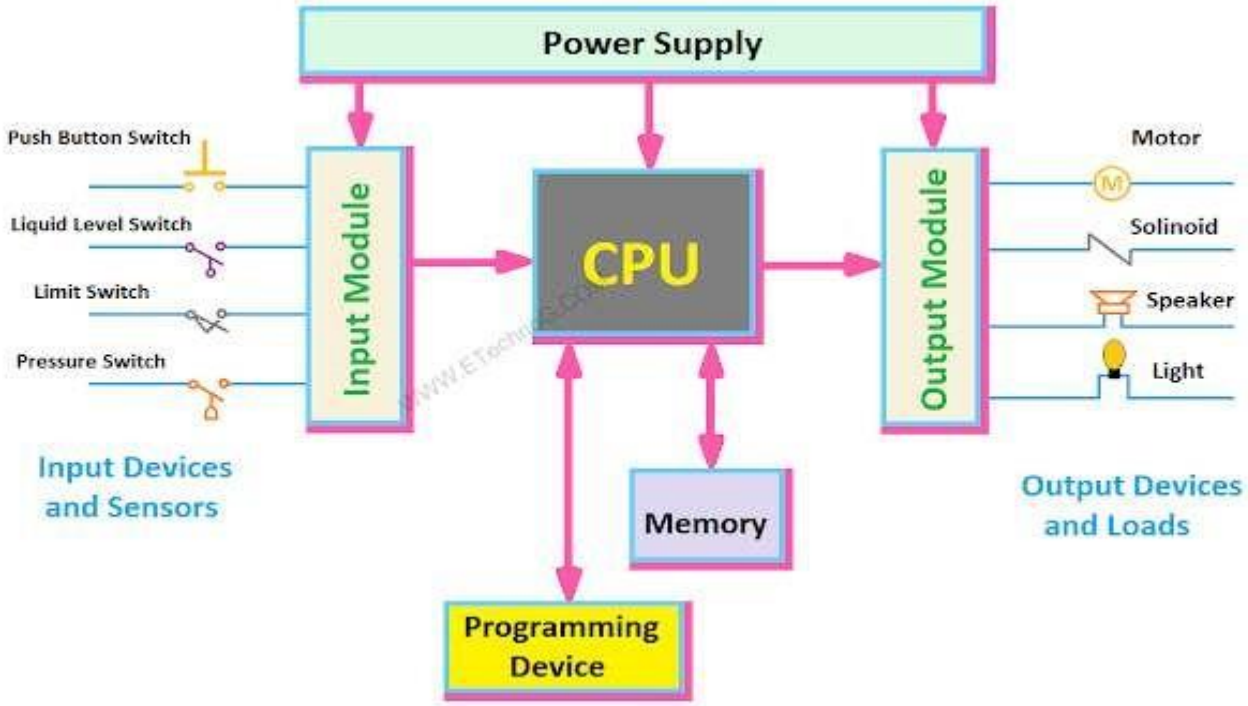
COMMANDS USED: Line, Trim, Offset, Copy, Move, Fillet, Text, Hatch.

PROCEDURE

1. Open **AutoCAD** from desktop

2. Set the drawing limits by clicking, **FORMAT - DRAWING LIMITS [LIMITS]** from menu bar and set the required values for both lower and upper limits.

3. Then click on **VIEW MENU - ZOOM - ZOOM ALL** to get enlarged view.
4. Set the units and precision from the format menu by clicking **FORMAT - UNITS**
5. Click on the **LINE** from the draw toolbar and drawn the horizontal and vertical line.
6. To change the properties of **LINE-**Click on **line type control** from **properties** toolbar. And click on **other** .then load the required line type from **line type manger.** Then select the line and change it in to the required line type.
7. Click on the **TRIM [TR**] command from the modify toolbar to remove the drawn line at required point.
8. Then click on **FILLET [F**] command from the modify toolbar, enter the value of radius and select the object to be joined.
9. Then by clicking on **COPY [CO] ,MOVE [M] & ROTATE [RO]** commands from the modify toolbar, at required places.
10. Select **HATCH [H]** from the draw toolbar for the shading the required areas at suitable scale.
11. The related details on the drawings are mentioned by clicking the **TEXT [T] Mtext** from the draw toolbar.
12. Finally the outer dimensions are shown by clicking dimensions from the menu bar and give the required dimensions.**[DLI& DCO]**
13. The drawings is saved by clicking **FILE** &**SAVE**



RESULT: the Simple PLC Module showing I/O points is drawn using CAD

Signature of staff

CIE-1 Skill Test Scheme of Evaluation

SL. No.	Particulars/Dimension		Marks
1	Draw the single line diagram of a MUSS/substation i. Use of suitable commands ii. Labelling iii. Indexing	 25 15 10	50
2	Draw the wiring diagram of a MCC Panel Board i. Use of suitable commands ii. Labelling iii. Indexing	 25 15 10	50
		Total Marks	**100**

CIE-2 Skill Test Scheme of Evaluation

SL. No.	Particulars/Dimension		Marks
1	Design a Simple PLC Module showing I/O points. i. Use of suitable commands ii. Labelling iii. Indexing	 20 10 10	40
2	Assembly drawings Sectional end view and front elevation (Front elevation and plan in case of transformer) i. Use of suitable commands ii. Sectional end view/ front elevation iii. Front elevation/plan iv. Dimensioning v. Labelling	 10 15 10 10 05	50
3	Translate 3D drawing for the given Sketch (CAD)		10
		Total Marks	**100**

: SEE Scheme of Evaluation

SL. No.	Particulars/Dimension		CO	Marks
1	**Winding diagrams** Draw the winding diagram using CAED software. i. Develop winding table ii. Draw sequence diagram iii. Mark the poles iv. Show the direction of induced emf and indicate the position of brushes and show the direction of current. **OR** **Single line diagram** Draw the single line diagram of a MUSS/substation i. Use of suitable commands ii. Labelling iii. Indexing **OR** **Building wiring drawing/Panel Wiring Drawing** Estimate and draw Electrical wiring of a residential building/ Estimate and draw: Electrical wiring of a small workshop. i. Use of suitable commands ii. Labelling iii. Indexing	 20 05 05 05 05 20 10 10 20 10 10	1,2	40
2	**Assembly drawings** Sectional end view and front elevation (Front elevation and plan in case of transformer) i. Use of suitable commands ii. Sectional end view/ front elevation iii. Front elevation/plan iv. Dimensioning v. Labelling **OR** 3D Drawing- Squirrel cage Induction motor. i. Use of suitable commands ii. Labelling iii. Indexing	 05 10 10 10 05 25 15 10	1,3, 4	50
3	Viva-voce			10
		Total Marks		**100**


THANK YOU