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Date

ENGINEERING GRAPHICS NOTES

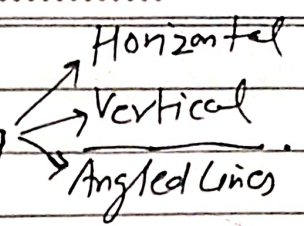
By AJAY NEHRA

THEORY PORTION

ONE MARKS QUESTIONS

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(2)

- Q.1. T-Square is used for drawing  lines.
- Q.2. In Third projection method, plane comes between observer and Object.
- Q.3. An Untrimmed drawing sheet having size 880×1230 is designed as A0.
- Q.4. A hidden object is shown by dash line.
- Q.5. In 7:4 Ratio Lettering, the height is taken as 7 units and breadth is taken as 4.
- Q.6. Length of arrow head is 3 times the thickness of arrow head.
- Q.7. Diagonal scale is used to represent 3 Consecutive Units.
- Q.8. A pentagon has 5 sides.
- Q.9. The edge on the board ~~of~~ on which T-square is made to slide is called its Working Edge.
- Q.10. In a conic, the line passing through the fixed point and perpendicular to the fixed line is called Axis.

Q.11. For drawing a small Component Enlarged Scale is used.

Q.12. When a point is above H.P its front view is above XY.

Q.13. When the axis of an object is perpendicular to V.P, it is 'Parallel' to the H.P.

Q.14 The number of mutual perpendicular planes that can surround one object in space is 03.

Q.15. Isometric length is reduced to 81.6% of its true length.

Q.16. 7B is the softest and 9H is the hardest pencil.

Q.17. An ellipse can be drawn by Concentric Circle method.

Q.18. Projection of an object on V.P is Front View.

Q.19 Projection of an object on H.P is Top View.

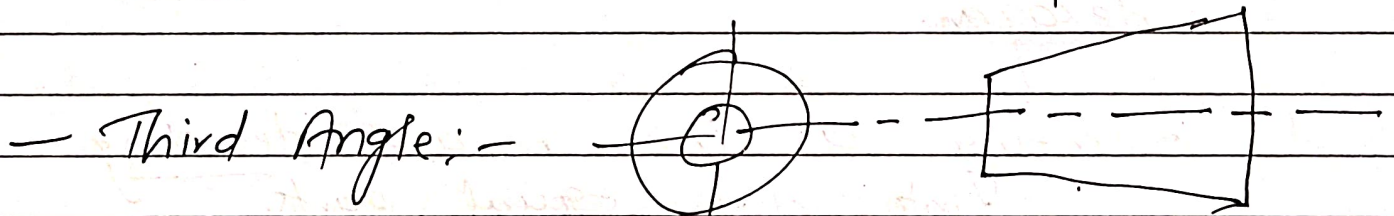
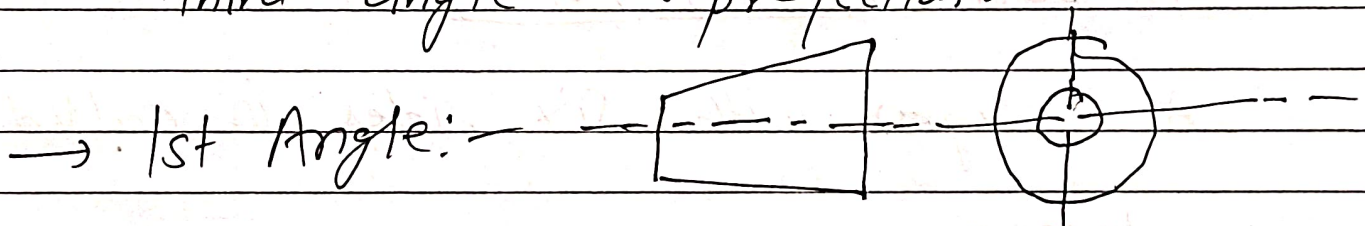
Q.20. In half section view object is imagined to be cut-off ~~Half~~ One-Quarter Spiral

Q.21. A small size drawing machine is called Mini-Drafter.

Q.22. Angle b/w true length and Isometric length on scale is 15° .

Q.23. In Isometric projection, All three axis are equally inclined to the pictorial plane.

Q.24. Sketch the symbol of 1st and third angle projection.



Q.25 Define Engineering Drawing.

Ans. It is standardized graphical ~~representation~~ representation of components, structures, objects or system used to communicate technical requirements.

Also it is a type of technical drawing used to convey information about an object.

Q.26. Drawing is considered as :-

Ans Language of Engineer.

Q.27 Engineering drawing helps in Communication of Ideas.

Q.28. Which Instrument is used to draw circles.

→ Compass and Circle master.

Q.29. Standard size of drawing sheet includes A0 to A4.

Q.30 A polygon with six sides is called.
Hexagon.

Q.31 Bisecting a line means deviding
into two equal parts.

Q.32 Instrument lettering height ranges
from 20-35 mm.

Q.33 Gothic lettering is generally.

→ Vertical or Inclined.

Q.34. Inclined lettering is generally at

→ 75° .

Q. 35. Dimensioning is generally used to

→ provide measurements.

Q. 36. Dimension lines are drawn using

→ Thin Lines.

Q. 37. Arrow head in dimensioning indicates:-

→ Limits of dimension.

Q. 38. - P. C. D. stands for

→ Pitch Circle Diameter

Q. 39. R. F. stands for.

→ Representative Fraction.

Q. 40 → Scale is defined as

→ Ratio of drawing to actual size

Q. 41. Which scale is used for accurate measurement?

→ Diagonal Scale.

Q. 42 - Full scale means

→ Drawing same as object → 1:1

Q.43. Reducing scale is used when:-

→ Object is large

Q.44. Orthographical projection is used to represent:

→ 3D object in 2D

Q.45- Number of principal plane in orthographic projection.

→ 2

Q.46. The two principal planes are

→ H.P and V.P.

Q.47. First angle projection is commonly used in:-

→ India

Q.48. In First angle projection, object is placed in

→ First Quadrant

Q.49. In Third angle projection, object is placed in

→ Third Quadrant.

Q.50 In which Quadrants, object is placed, then no orthographic projection is valid.

→ 2nd and 4th.

Q.51. A point above H.P and in front of V.P lies in

→ First Quadrant

Q.52. A point above H.P and behind V.P lies in

→ 2nd Quadrant

Q.53 → A Point below H.P and in front of V.P, lies in

→ Fourth Quadrant

Q.54- A point below H.P and behind V.P, lies in

→ Third Quadrant.

Q.55 A line parallel to both planes will appear:-

→ True length

Q.56 A line perpendicular to H.P appears as:-

→ Point in Top view

Q. 57 True length of line is obtained when:

→ Parallel to Plane

Q. 58 Projection of inclined line shows:-

→ Foreshortened length

Q. 59 H.T stands for → Horizontal Trace.

Q. 60. V.T stands for — Vertical Trace

Q. 61. A circle in inclined plane appears as

→ Ellipse

Q. 62 - Sectioning is used to

→ Show Internal details

Q. 63. Cutting plane line is drawing using

→ Chain line

Q. 64 Full section means Fully Cut.

Q. 65 Half Section is used for symmetrical objects

Q. 66. Offset section is used when

→ Features are not aligned.

Q.67. Hatching Line indicates

→ Material Cut

Q.68 Angle of Hatching lines is usually

→ 45°

Q.69. Broken-out section shows

→ Partial Internally Details

Q.70 — Removed Section is

→ Drawn seperately

Q.71. → Shortcut of Trim Command is

→ TR

Q.72 — Short cut of Circle Command in Autocad is C

Q.73 — Round Corner of an Object in AutoCad is made by _____ Command.

→ Fillet Command

Q.1. What are the sizes of different drawing ~~boards~~ sheets (Trimmed) / Untrimmed

Ans.		Trimmed	Untrimmed
	A ₀	841 X 1189	
	A ₁	594 X 841	
	A ₂	420 X 594	
	A ₃	297 X 420	
	A ₄	210 X 297	

Q.2. What are the sizes of different drawing boards.

Ans	Board type	Size.		
		L	W	H
	B ₀	1500	1000	25
	B ₁	1000	700	25
	B ₂	700	500	15
	B ₃	500	350	15

Q.3 Define R. F.

Ans. Representative Fraction - This is the ratio of size of the object on drawing sheet to the actual size of object.

$$R. F = \frac{\text{Size of object on sheet}}{\text{Size of object in Actual.}}$$

Q.4 Define Isometric projection

Ans It is a 3D pictorial representation of an object in 2D displaying length, width and height in a single view with all three coordinate axes.

Q.5 Write down function of mini-drafter.

Ans It is used to draw parallel and perpendicular lines and angular lines without multiple tools.

Q.6 Write down two Drawing Instruments.

① Mini-Drafter ② Scale ③ Drafter ④ Drawing Board
⑤ Drawing sheet ⑥ Pencil ⑦ Compass ⑧ Divider ⑨
protector ⑩ Circle marker ⑪ T-Square ⑫ Tape
⑬ Eraser etc.

Q.7. Name different grading of Pencils.

Ans:-	Hard	Medium	Soft
9H 8H 7H 6H 5H 4H	3H, 2H, H, F HB, B	2B, 3B, 4B, 5B, 6B, 7B	

Q8. What is purpose of lettering in E.G.?

Ans. To provide clear and Uniform Text, dimension and specification, easy to read and accurately interpreted.

Q9. What is Traces of a Plane?

Ans:- Traces of Planes in engineering drawing are the line of intersection formed where a plane meets the principal reference plane. This is of two types i.e HP & VP

Vertical Trace → Intersection line with VP
Horizontal Trace — Intersection line with H.P.

Q.10. What is Dimensioning?

Ans. It defines the precise size, location and geometry of parts using lines, notes and symbols.

~~Type~~

Q.11. What is Free Hand Sketching?

Ans: - It is a technique for creating, communicating design ideas without instrument as proper proportion and scale.

Q.12. Define Oblique plane?

Ans: - It is a surface inclined to all three principal projection plane (Horizontal, Vertical and Profile), which is neither parallel nor perpendicular.

Q.13 Development of surface →

Ans. It is defined as the process of unfolding or unrolling a 3D object surfaces onto a 2D plane to show its true size.

Q.14 Expand P.P, H.P and V.P.

Ans H.P — Horizontal plane
V.P — Vertical plane
P.P — Projection plane

Q.15 Define Plane -

Ans: It is a 2D surface with length and breadth but no thickness.

Q.16 Define Scale?

Ans. It is the fixed ratio of an object's drawing size or object's size on sheet to its actual size.

Q.17 Define Artistic drawing.

Ans:- It is a type of drawing by which an shadow or drawing of an object is drawn using line tone and texture without proper dimensioning.

Also it represents an object, figure or idea on two dimensional surface without proper dimensioning.

Q.18 The distance b/w two section lines varies from 0.2 to 0.7mm.

Q.19 The method used to develop Right Circular Cone is "Radial line Development Method".

Q.20 Define "Identification of Surface".

Ans:- It involves recognizing and Mapping 3D object faces on to 2D views i.e. Top, Front and Side using orthographic projection.

Q.21 Dimensioning is done to show the "Size" of an object.

Auto-CAD IN ENGINEERING GRAPHICS

16

Q.1 Commands used in Auto-CAD.

Ans. Basic Commands of Auto-CAD

Line — L — Create straight line

P Line — PL — Create a two dimension poly line

Circle — C — Drawing Circle using Radius or Diameter

ARC — A — Draw Arcs

RECTANGLE — REC — Draw a rectangular poly line

ELLIPSE — EL — Create an ellipse

HATCH — H — Fills an enclosed area with hatch pattern

TRIM — TR — Cut objects to meet Edge of other object

OFFSET — O — Create Concentric Circles, Parallel lines and Curves

FILLET — F — Round or Caps the edges of objects

MOVE — M — Shift object to a new position.

COPY — CO / CP — Duplicate Object

EXTEND — EX — Extend object to meet edge of other object

ROTATE — RO — Rotate Object around a base point

Spiral

STRETCH — S — Stretched object crossed by a selection window or polygon

ERASE — E — Remove object from Drawing

EXPLODE — X — Break a compound object into its component.

MATCH PROP — MA → Applies properties of a selected object to other object.

Q.2. Write a short note on coordinate system used in Auto-CAD.

Ans. Auto-CAD primarily uses a Cartesian coordinate system (x, y, z) to define precise locations operating on two main system:-

① ~~World~~ World Coordinate System (WCS)

② User Coordinate System (UCS)

① WCS is default and permanent coordinate system at the base of all drawings.
Here the origin is (0, 0, 0)

② UCS is a movable system which allows user to re-define X-Y plane for creating object in 3D spaces.

There are 3 coordinate input methods are in Auto-CAD.

① Absolute Coordinates:- In this point defines relative to the origin $(0, 0, 0)$

ex. $A(0, 0)$ $C(3, 3)$
 $B(3, 0)$

② Relative Coordinate:- In this points defined in relation to the last entered point using ~~@ symbol~~ @ symbol.

ex. $A @ 0, 0$
 $B @ 3, 0$
 $C @ 3, 3$

③ Polar Coordinates:- It defines points based on distance and angle from previous points.

ex. $A(0, 0)$
 $B @ 3 < 0$
 $C @ 3 < 90$

Q.3 Write any four advantages of Auto-CAD.

Ans. Auto-CAD is a tool, used to design and draw an object in 3D and 2D in the Computer. It is a leading Computer-Aided - design (CAD) software developed by Autodesk to create 2D and 3D technical drawings.

Advantages:-

- ① High Precision and Accuracy
- ② Increase efficiency and productivity

- ③ Easy modifications
- ④ 3D modeling
- ⑤ Standardization is maintained
- ⑥ Reduced Cost
- ⑦ Reduced Time
- ⑧ Improve Presentation.

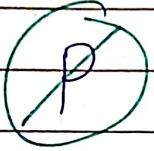
Q4. Define any four editing Commands in AutoCAD

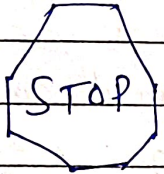
- Ans:-
- ① OFFSET — Create Concentric Circle
Parallel line / Curve line
 - ② TRIM — To cut objects
 - ③ FILLET — To Round the edge
 - ④ MIRROR — Create symmetric Part

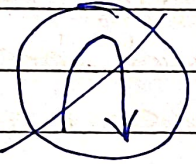
Q.4(a) - Write four applications of Auto-CAD

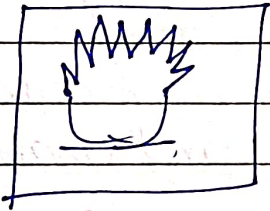
- Ans:-
- ① For Architectural Drawing
 - ② For Designing Mechanical components
 - ③ Designing of Roads and bridges, landscaping layouts
 - ④ For Interior design
 - ⑤ For 3D modelling
 - ⑥ Mainly to make 3D design of every component.

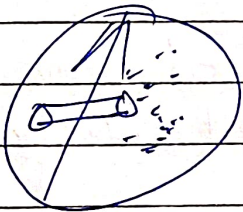
Q.5. Draw any four safety symbols and their uses.

Ans. -  - No-parking

 - To stop Traffic

 - No-U Turn (D'nt take U-turn
it may be dangerous.

 - Fire hazard (Do not cross
this because there is a
danger of fire in this area.

 - No Smoking Zone

Q.6. Write Differences b/w Drawing and Engineering Drawing.

Ans:→

Drawing is a broad, often Artistic visual representation of ideas, objects or emotions. frequently done freehand.

Engineering Drawing is a precise, technical and standard language used in engineering and manufacturing to communicate exact specification i.e. dimensions, tolerance and Material.

Parameters

Drawing

Engineering Drawing

① Purpose

Subjective Impression

Accurate and Unambiguous

② Precision and Standard

Subjective and less rules

Follow strict industry standards

③ Tools

Often free hand and sketched

Used CAD, softwares All drawing instruments

④ Content

No specifications only visuals

Shows detailed view section and assembly

Q7. What is scale? Explain types of scale.

Ans:- In engineering drawing scale is defined as it is the ratio of object size on drawing sheet to its actual size, used to represent large items (like buildings) or tiny parts (like gears) on paper or drawing sheet.

It ensure accurate proportion, commonly denoted as Ratio (ex. $1:100$) or a R.F (Representative Fraction)

Types of Scale $\rightarrow$ There are three type of scale.

① Reduced Scale $\rightarrow$ Used for large objects to fit on paper ($1:X$).

For example $1:100$ scale indicates large scale, that a object is 100 time smaller on drawing sheet than its actual size.

② Enlarged Scale $\rightarrow$ ($X:1$) Used for small items.

For ex. ($5:1$) scale means the drawing is five times larger than actual size as watch components

③ Full Scale: ($1:1$) Used when the object is drawn as its exact, actual size.

Q.8:- What are the differences b/w First Angle Projection and Third Angle Projection.

Ans:- In orthographic projection, there are two possible projection ~~are~~ by which we can draw a 3D object in 2D. These two possible projection are First Angle Projection and Third Angle Projection. Differences b/w these projections are as follows:-

First ANGLE

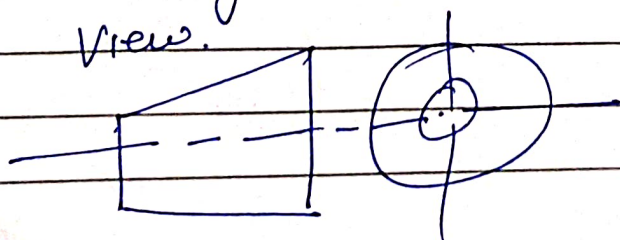
In this object is placed in First Quadrant

Object is in between the plane and observer

Front view is drawn above the reference line

Top view is arranged vertically below the front view.

Left side view drawn on Right side and Right side view drawn on left side ~~all~~ aligned with Front View.



Thirt ANGLE

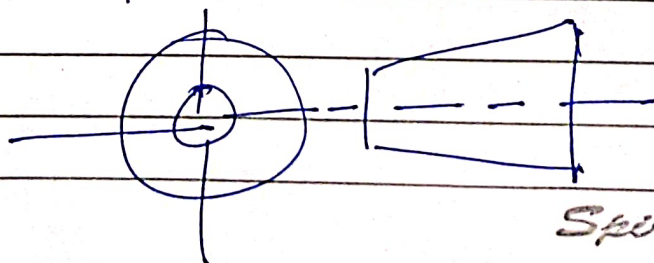
In this object is placed in Third Quadrant

~~Object~~ Plane is in between Object and observer

Front view is drawn below the reference line

Top View is arranged vertically above the front view.

Left side view drawn on left side and Right side view drawn on Right side aligned with Front View.



Spiral

Q.9. What is sectional view? Explain the types of sectional view.

Ans:- Sectional view in engineering drawings ~~are~~ are 2D orthographic projections that reveal internal features (holes, cavity) by performing a cut through an object.

The purpose of sectional view is to eliminate complex and confusing hidden lines.

Types of sectional view:->

- ① Full Section ② Half Section ③ Offset Section
④ Broken-out Section ⑤ Revolved / Removed Section

① Full Section :- The cutting plane cuts completely through the object.

② Half Section :- It is used for symmetrical parts. One quarter of the object is removed, showing half in section and half in exterior view.

③ Offset-section :- The cutting plane is bent to pass through multiple important features not in a straight line.

④ Broken-Out Section - In this only a specific portion is cut away to show internal details.

⑤ Revolved / Removed Section - It used to show cross-sectional shapes of Bars.

Q.10 What is dimensioning? Explain methods of dimensioning.

Ans:- Dimensioning is the precise notation of a part's size, shape and location using lines, symbols and numerical values.

It ensure that the drawing communicates all information of the object in the object view to the viewer.

Dimension line, Extension line, ~~Leader~~ Leader line
Dimension values and visible gap are the key components of Dimensioning.

Mainly three types of Dimensioning is there.

① Size Dimensions

② Location Dimensions

③ Reference Dimensions

① Size:- It defines the size of the object like length, breadth, height, diameter etc.

② Location:- It defines the location of object or feature from datum or edge.

③ Reference:- This is given for information only, which enclosed in brackets [].

Q. 11 Give four applications of following lines

- i) Continuous thick line
- ii) Continuous thin line

Ans:- i) Continuous Thick Line uses:-

- a) Used for visible object outline
- b) " " Main outline
- c) " " sectional view

ii) Continuous thin line uses:-

- a) Leader Line
- b) Projection line
- c) Dimension line
- d) section line.

Q. 12:- What is minidrafter? Explain its uses.

Ans:- A minidrafter is an essential and portable drawing instrument for engineering students which allows easy creation of parallel, perpendicular and inclined lines. It is mounted on top-left of drawing board which has adjustable metal arms and ~~a~~ transparent scale for precision.

Uses of Minidrafter:-

- ① To draw parallel lines
- ② To draw perpendicular lines
- ③ To draw inclined lines
- ④ To precise technical drawings
- ⑤ To measure angles
- ⑥ Also to draw projection lines.

Q.13. What is T-Square? Explain its uses.

Ans:- T-Square:-

It is fundamental technical drawing instrument used to draw precise horizontal lines and create parallel lines across a drawing board. It acts as a guide for drawing tools and provide a base for set-square.

① Drawing
Uses →  Horizontal lines: → Its blade act as a straight edge, also provide a guide line for straight line.

② Drawing Parallel lines →

It can be slip up and down and can be used to draw parallel line on the sheet.

③ It is used for setting up drawing paper.

④ Used to marking measurements.

Q.14. What are different types of projections?

Ans:- Projection → It draws 3D objects in 2D planes.
It is a method or process to draw 3D objects in 2D.

Types of Projection:-

- ① Orthographic projection
- ② Pictorial Projection
- ③ Perspective projection

① Orthographic projection:→ It is also known as parallel projection. It is most common technique of projection. It creates 2D multi views (Front, top and side) that show the true size and shape of object. It is of two types

- ① First angle Projection
- ② Third angle Projection

② Pictorial Projection:- It shows 3D object in a single view to provide a realistic impression. It is of three types

- ① Isometric
- ② Oblique
- ③ Trimetric

③ Perspective Projection:- It is a 3D to 2D mapping technique that simulate human vision producing realistic images.

Q-15 Give Designation and size of All types of drawing sheets.

Ans:

Designation	Untrimmed	Trimmed.
A0	890 X 1230	841 X 1189
A1	625 X 880	594 X 841
A2	450 X 625	420 X 594
A3	330 X 450	297 X 420
A4	240 X 330	210 X 297
A5	165 X 240	148 X 210

Q.16 Draw projection of long break line and Ditto Line.

Ans.

long break Line



Ditto Line



Q.17. Define Isometric Scale and Isometric line

Ans:- Isometric Line:-

These lines in engineering drawing are lines parallel to the three established isometric axes (x , y and z) drawn at 30° , 90° and 30° to a horizontal reference.

They are used to create 3D, non-perspective presentations where parallel lines remain parallel and measure directly.

Isometric Scale:- It is a special scale used in EGs to accurately represent 3D object in 2D by reduction of 18% of true size or we can say that an isometric length is 82% of the actual length of an object. ~~to~~
It is used to measure true length into reduced i.e. isometric length.

Q.18. Define Solids with examples.

Ans:- Solid is a three-dimensional object defined by length, breadth and thickness (height), represented on a 2D plane through orthographic projection. Solids are bounded by plane surfaces or curved surfaces including Prisms, Pyramids, Cylinders, cones and spheres.

Types of Solids:-

① Polyhedra:- These are the solids which are bounded by plane faces.
ex. Tetrahedron, Cube, Prisms, Pyramids

② Solids of Revolution →

These are formed by revolving a flat shape.
ex.

① Cylinder ② Cone ③ Sphere.

Q.19. List the Main Drawing Instruments with their uses.

Ans:-

Q.19 Write differences between half section view and full section view.

Ans. A full section view cuts through the entire object to reveal internal objects while in half section it removes only one quarter of the object showing both internal and external features in single view.

Differences:-

Parameter	Full	Half
Cut-depth	Entire Object	Half way / Center line
Material Removed	50%.	25%.
View Features	All Internal details	Internal + External
Symmetry	For Non-symmetrical items	For Symmetrical Items
Line Separation	None	Center line

Q.20 What is engineering drawing? Explain its types.

Ans. Engineering Drawings:-

It is a drawing used to communicate the design, dimension and manufacturing instructions for products or structures. It act as a visual language for engineer.

and producer to produce part accurately.

Types of Engineering drawing:-

① Based on purpose:-

- ① Detail Drawing.
- ② Assembly Drawing
- ③ Working Drawing
- ④ Installation Drawing
- ⑤ Schematic Drawing

② Based on Nature of object:-

- ① Mechanical Drawing → Used for machines, engines and mechanical components.
- ② Civil/Structure Drawing:- Used for detailed structure like buildings, bridges
- ③ Electrical Drawing:- Used for Diagrams for wirings and Circuits
- ④ Electronics Drawing:- Used for Circuits and PCB layouts.
- ⑤ Architectural Drawing:- Used for detailed plans for building designs

between half section view and
view:

on view cuts through the entire
real internal object while in
removes only one quarter of
ing both internal and external
single view.

Half
Half way/Center line
25%
Internal details
Internal + External
- Symmetrical
For Symmetrical Parts
Center line

ing drawing? Explain its type.

(31)
Date

and produces to produce part accurately.

Types of Engineering drawing:-

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(32)
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