Rashtreeya Sikshana Samithi Trust

RV COLLEGE OF ENGINEERING®: BENGALURU - 560 059

DEPARTMENT OF MECHANICAL ENGINEERING

Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi
Approved By AICTE, New Delhi, Accredited by NBA, New Delhi.

VISION

Quality education in Design, Materials, Thermal and Manufacturing with emphasis on research, sustainable technologies and entrepreneurship for societal symbiosis.

MISSION

- Imparting knowledge in basic and applied areas of Mechanical Engineering.
- Providing state-of-the-art laboratories and infrastructure for academics and research in the areas of design, materials, thermal engineering and manufacturing.
- Facilitating faculty development through continuous improvement programs.
- Promoting research, education and training in materials, design, manufacturing, Thermal Engineering and other multidisciplinary areas.
- Strengthening collaboration with industries, research organizations and institutes for internship, joint research and consultancy.
- Imbibing social and ethical values in students, staff and faculty through personality development programs

Programme Educational Objectives (PEOs)

- Successful professional career with a sound fundamental knowledge in Mathematics, Physical Sciences & Mechanical Engineering
- Expertise in specialized areas of Mechanical Engineering such as Design, Thermal, Materials and Manufacturing Engineering with a focus on research and innovation
- Ability of problem solving by adopting analytical, numerical and experimental skills with awareness of societal impact
- Sound communication skills, team working ability, professional ethics and zeal for life-long learning

POs of the Mechanical Engineering Program

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and specialization in Mechanical Engineering for the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of the information
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.to provide valid conclusions.

Syllabus

Semester: I/II

COMPUTER AIDED ENGINEERING GRAPHICS (Lab)

(Common to all branches - Theory & Practice)

Course Code: ME111BL/ME121BL — CIE Marks: 50
Credits: L:T:P 1:0:2 — SEE Marks: 50
Total Hours: 15 (T) + 60 (P) — SEE Duration: 03 Hours

Unit-I — 14 Hrs.

Introduction: Significance of engineering graphics, BIS conventions, drawing sheets, drawing scales, dimensioning, line conventions, material conventions. Symbolic representation of fasteners - bolts and nuts, riveted, welded, brazed and soldered joints, bars and profile sections, electrical & electronic elements and piping.

Use of Simple CAD Tools: Overview of CAD software [Menu bar, tabs -sketch, modify, dimension, annotation and commands].

Orthographic Projections: Principles of orthographic projections - quadrant systems, projection of points (All quadrants); Projection of lines (first angle projection); Projection of planes - inclined to HP & VP (first angle projection).

Unit-II — 12 Hrs.

Projection of Solids: Prisms, pyramids, cylinder & cone with axis inclined to HP and VP (first angle projection).

Unit-III — 18 Hrs.

Isometric projection: Isometric scale, Isometric Projection of regular solids and combination of two simple solids

3D modelling of Components: Conversion of isometric view to orthographic views and sectional views, missing views in orthographic projections.

Unit-IV — 15 Hrs.

Development of Lateral Surfaces: Introduction to section planes, methods of development -parallel line method and radial line method – prism and cylinder (truncated), pyramid and cone (frustum and truncated)

Unit-V — 18 Hrs.

Engineering Components:

Assembly of Hexagonal bolt with nut (with washer)-3D
Riveted joint: - butt joint with two covering plate (chain riveting): 3D
Union joint, butt muff coupling, socket and spigot joint: 3D
Basic building drawing (Plan and Elevation): 2D
Electrical wiring and lighting drawing: 2D
Electronic PCB drawings

Course Outcomes: After completing the course, the students will be able to

CO1: Understand the convention and methods of engineering drawing
CO2: Enhance their visualization skills to develop new products
CO3: Elucidate the principles of multi-view drawings and pictorial drawings
CO4: Apply the knowledge of engineering graphics to develop respective (simple) engineering assembly

Reference Books:

1. Textbook of Engineering Graphics by K R Gopalakrishna, Sudhir Gopalakrishna, Subhash Publishers, 40th Edition, 2018; ISBN 978-9383214204
2. SOLIDWORKS 2020 for Designers by Sham Tickoo Purdue University, CADCIM Technologies, 18th Edition, 2019; ISBN: 978-1640570849
3. Machine drawing by N. D. Bhatt, V. M. Panchal, Charotar Publishing House, 50th Edition, 2016; ISBN: 978-9385039232
4. NPTEL :: Mechanical Engineering - Engineering Drawing

Continuous Internal Evaluation - Assessment and Evaluation Pattern

Weightage	50%(CIE)	50%(SEE)
Manual Drawing (Unit 1): Practice session	**10**	
Computer Drafting : Practice Session	**15**	
Test – I	Each test will be conducted for 50 Marks adding upto 100 marks. Final test marks will be reduced to-**10**	*****
Test – II		
Project/Assignment/ Experiential Learning	**15**	*****
Maximum Marks	**50**	**50**
Total Marks for the Course	**100**	

CO-PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	1	-	1
CO2	3	2	2	1	-	-	-	-	-	1	-	1
CO3	3	3	2	2	-	-	-	-	-	1	-	1
CO4	3	3	3	3	-	-	-	-	-	1	-	1

High-3: Medium-2 : Low-1

Semester End Examination Scheme

PART A -Manual Drawing only (Answer any two questions)

Q. No.	Topic	Marks
Q1	Projections of Points	05
Q2	Projections of Lines	05
Q3	Projections of Planes	05

PART B – Computer Aided Drafting (CAD) (Answer any two questions)

Q. No.	Topic	CAD Marks
Q4	Projections of Solids, Isometric Projection and Development of Lateral Surfaces	15
Q5		15
Q6		15

PART C – Computer Aided Drafting (CAD)
(Answer any one out of four questions)

Q. No.	Topic	CAD Marks
Q7	Engineering Components	10

Evaluation of Drawing in workbook

Particulars	Marks
Conventions	02
Solution	06
Neatness	02
Total	**10**

INDEX

Name: _____ **USN:** _____

Sl. No.	Title	Max. Marks	Marks awarded	Date
1	Conventions/Geometrical constructions	10		
2	Projections of Points	20		
3	Projections of Straight Lines	30		
4	Projections of Planes	30		
5	Projections of Solids	40		
6	Isometric Projection	40		
7	Development of Lateral Surfaces	40		
8	Engineering Components	40		
	Total Marks awarded out of 250			
	Marks reduced to 50			

Continuous Internal Evaluation Scheme as per SAP			
Sl. No.	**Particulars**	**Maximum Marks**	**Marks Awarded**
1	**Sketch book + Lab work**	**50**	
2	**Manual Test + Lab Test Drawing**	**50**	
3	**Experiential Learning**	**10**	

CIE Marks for 50

Sketch book + Lab work (50 x 0.4)	Test (50 x 0.4)	EL (10)	CIE (50)

Signature of Staff

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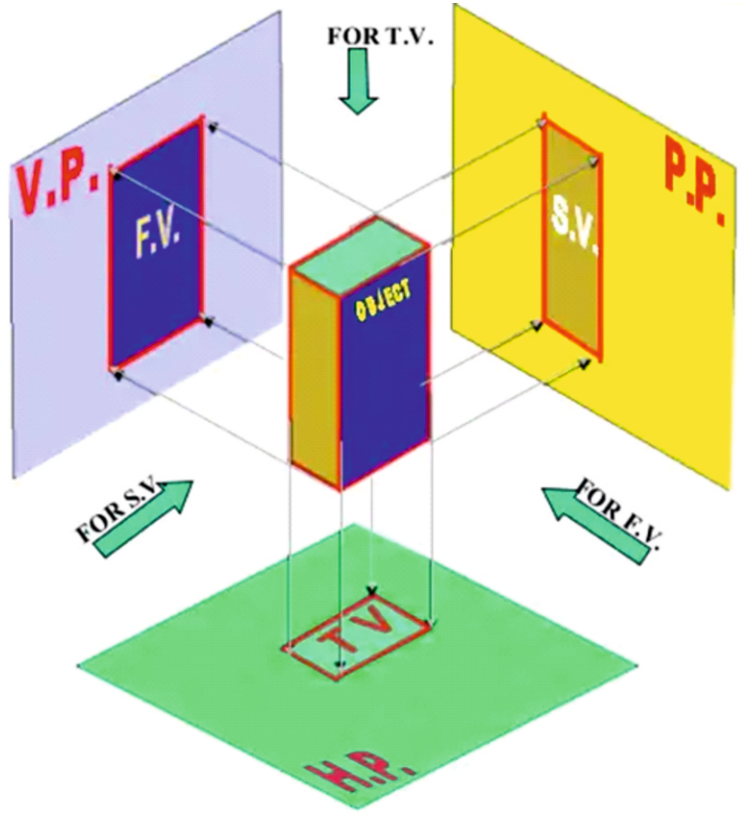
RV Vidyaniketan Post, Mysuru Road, Bengaluru - 560 059

Semester: I / II

Course Title: Computer Aided Engineering Graphics

Course Code: ME111BL/ME121BL

LAB MANUAL



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Certificate

This is to certify that Mr. / Ms. _____

bearing USN _____ *has successfully completed the course in* ***Computer Aided Engineering Graphics [ME111BL / ME121BL]*** *prescribed by the Department of Mechanical Engineering in the year* _____

50

Signature of Faculty

Name:

Date:

1. Conventions and Standards

1.1 Conventions and Standards: Standard sizes of drawing sheets, Lines, Dimensioning, Scales, conventions for materials.

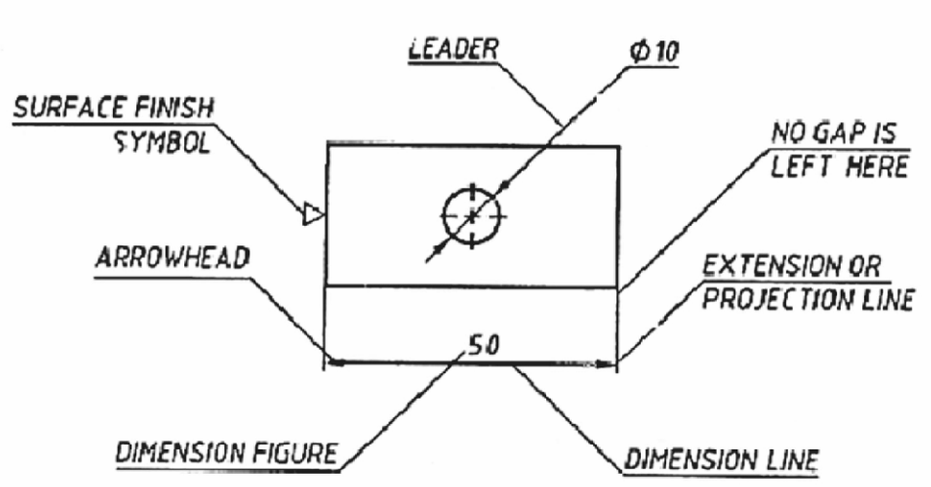
Standard sizes of drawing sheets:

Designation	Size (in mm)
A0	841 x 1489
A1	594 x 841
A2	420 x 594
A3	297 x 420
A4	210 x 297

Types of Lines:

Type	Illustration	Application
A	Continuous THICK	Visible outlines, Visible edges
B	Continuous THIN	Dimesion lines, Projection lines, Leader lines, Imaginary lines of intersections, Outlines of revolved sections
C	Continuous THIN Freehand	Boundaries or Limits of Partial or Interrupted views
D	Continuous THIN Zig-Zag	
E	Dashes THICK	Hidden outlines, Hidden edges
F	Dashes THIN	
G	Chain THIN	Centre lines, Lines of Symmetry, Trajectories
H	Chain THIN with THICK at ends & Changes of Direction	Cutting Planes
J	Chain THICK	Indication of surfaces to which special treatment applies
K	Chain THIN with Double Dash	Outlines of adjacent parts, Alternate and Extreme positions of movable parts, Centroidal lines, Initial outlines

Dimensioning:

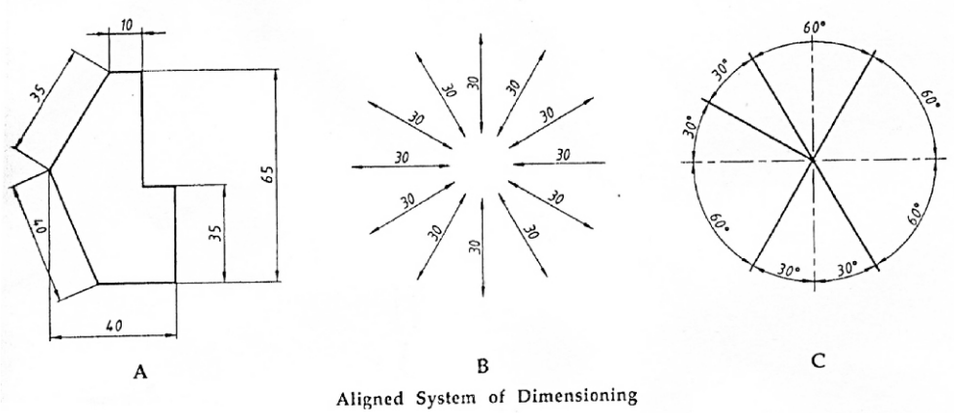


Elements of Dimensioning

Systems of Dimensioning:

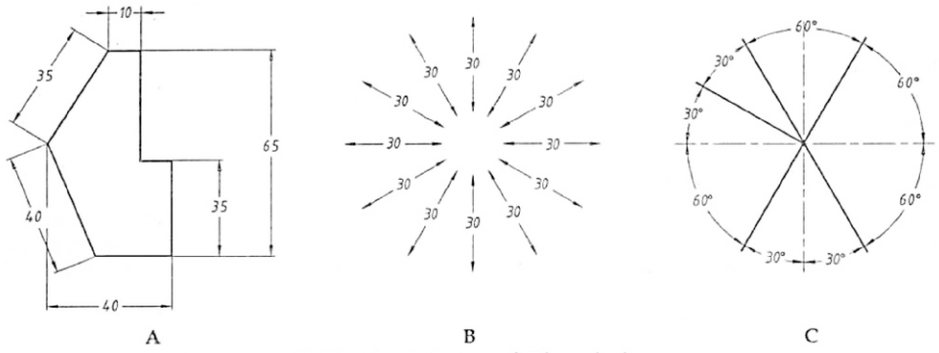
The two recommended systems of placing the dimension figures are : *Aligned System* and *Unidirectional System*.

Aligned System:



Aligned System of Dimensioning

Unidirectional System:



A B C

Unidirectional System of Dimensioning

Scales

Representative fraction

RF is a ratio between drawing size and actual size(of same units).

RF = drawing size / actual size

Eg. 1:2, 1unit on drawing represents 2units in actual.

Types of scales:

1:2	Reduced scale drawing
1:1	Full scale drawing
2:1	Enlarged scale drawing

Conventions for materials

Type	*Convention*	*Materials*
METALS		STEEL, CAST IRON, COPPER AND ITS ALLOYS, ALUMINIUM AND ITS ALLOYS, ETC
		LEAD, ZINC, TIN, WHITE-METAL, ETC
GLASS		GLASS
PACKING AND INSULATING MATERIALS		PORCELAIN, STONEWARE, MARBLE, SLATE, ETC
		ASBESTOS, FIBRE, FELT, SYNTHETIC RESIN PRODUCTS, PAPER, CORK, LINOLEUM, RUBBER, LEATHER, WAX, INSULATING & FILLING MATERIALS
LIQUIDS		WATER, OIL, PETROL, KEROSENE, ETC
WOOD		WOOD, PLYWOOD, ETC
CONCRETE		CEMENT CONCRETE

1.0 Geometrical Constructions

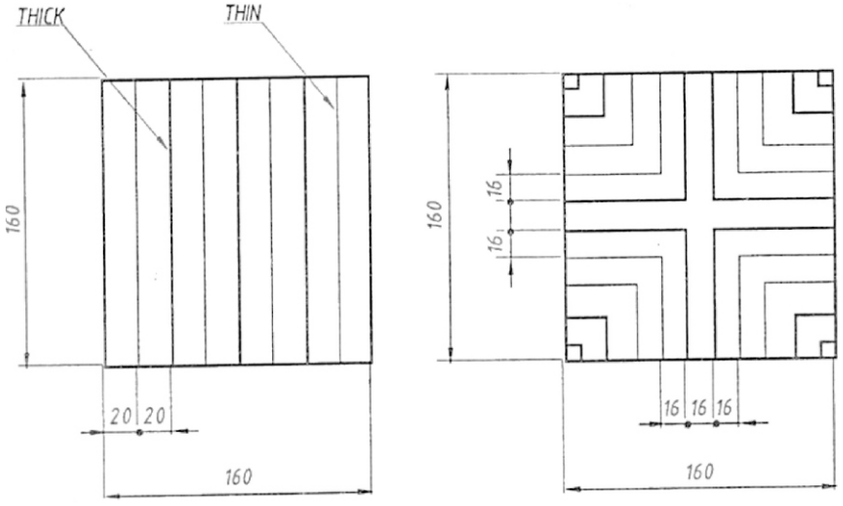
1.1 Divide a line AB 70mm into 6 equal parts.

1.2 Construct the following figures and dimension them.

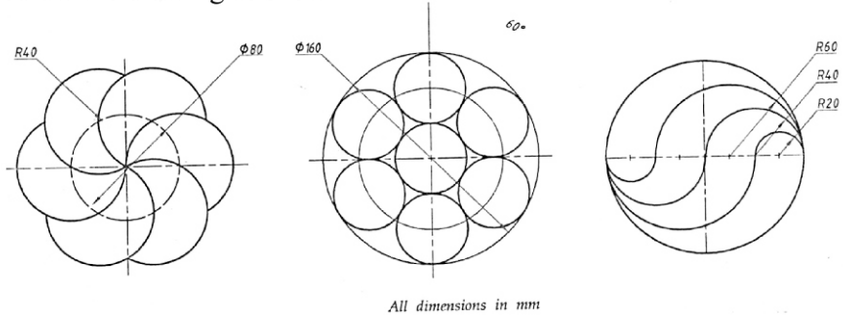
a) equilateral triangle of sides 30mm
b) regular pentagon of sides 30mm
c) regular hexagon of sides 25mm
d) circle of radius 20mm
e) concentric pentagons of sides 30mm and 50mm

1.3 Draw an equilateral triangle of 30mm sides. Construct a square, a pentagon and a hexagon of sides 30mm having one of their sides coinciding with the sides of triangle.

1.4 Redraw the drawing as shown.



1.5 Redraw the drawing as shown



2.0 Projection of Points (Manual Drawing)

2.1 Point A is 30mm in front of VP, 20mm above HP and 25mm infront of LPP. Draw the projections.

2.2 Point B is 20mm behind VP, 40mm above HP and 25mm infront of RPP. Draw its projections.

2.3 Point C is 25mm behind VP, 35mm below HP and 30mm behind RPP. Draw its projections.

2.4 Point D is 30mm in front of VP, 20mm below HP and 25mm infront of LPP. Draw the projections.

2.5 Draw the projections of the following points on the same XY line. State their quadrants.

a)A is 20mm in front of VP and 30 mm above HP.
b) B is 30mm in front of VP and in HP.
c)C is 40mm behind VP and 20mm below HP
d) D is 40mm behind VP and 50mm above HP
e)E is 40mm in front of VP and 30mm below HP.

2.6 A point 20mm below XY line is the top view of three points P, Q and R. P is 25mm below HP, Q is 35mm above HP and R on HP. Draw the projections of the three points and state their positions with reference planes and the quadrants in which they lie.

2.7 A point 30mm above XY line is the front view of two points E and F. E is 35mm behind VP and F is 40mm infront of VP. Draw the projections of the two points and state their positions with reference planes and the quadrants in which they lie.

3.0 Projection of Lines (Manual Drawing)

3.1 A line AB 60mm long has one end 20mm in front of VP and 15mm above HP. The line is inclined at 25° to HP and 40° to VP. Draw the front view and the top view of the line.

3.2 The line AB measuring 70mm has its end A 15mm infront of VP and 20mm above HP, the other end B is 60mm infront of VP and 50mm above HP. Draw the projections of the line and find the inclinations of the line with both the reference planes of projection.

3.3 A line AB, 65 mm long, has its end 20 mm above HP and 25 mm infront of VP. The end B is 40 mm above HP and 65 mm infront of VP. Draw the projections AB and show its inclinations with the HP and VP.

3.4 The top view pq of a straight line is 70mm and makes an angle of 60° to XY line. End P is 10 mm in front of VP and 30mm above HP. The difference between the distances of P and Q above HP is 45mm. Draw the projections and determine the true length and true inclinations with HP and VP.

3.5 A line AB having one of its end 10mm above HP and 15mm infront of VP is inclined at 30° to HP and 45° to VP. Its top view is 50mm long. Draw the projections of the line and find out its true length.

Critical Thinking Exercises

3.6 Draw the projections of a straight line AB, 100mm long, inclined at 45° to HP and 30° VP. The end A is in HP and the end B is in VP.

3.7 The front view of a line is 50mm long and 55° to the XY line. The line is inclined at 30° to VP. Draw the projections of the line and find its true length and true inclination with HP. One end is 15mm above HP and the other end is 10mm infront of VP.

4.0 Projection of Planes (Manual drawing)

4.1 An equilateral triangular lamina of 30mm sides resting on one of its sides on HP. The lamina makes 45° with HP. Draw its front view and top view.

4.2 An equilateral triangular lamina of 30mm sides resting on one of its corners on HP. The lamina makes 40° with HP and the side opposite to the corner on which it rests is inclined at 30° to VP. Draw its front view and top view.

4.3 A square lamina of 30mm side rests on one of its sides on HP. The lamina makes 60° to HP. Draw its front view and top view.

4.4 A square ABCD of 40mm side has its diagonal AC inclined at 45° to HP and the diagonal BD inclined at 30° to VP and parallel to HP. Draw its front view and top view.

4.5 A rectangular lamina of sides 40mm X 60mm rests on HP on one of its longer edges. The lamina is tilted about the edge on which it rests till its plane surface is inclined to HP at 45°. The edge on which it rests is perpendicular to VP. Draw its front view and top view.

4.6 The pentagonal lamina of 30mm sides resting on one of its sides on HP. The lamina makes 45° with HP. Draw its front view and top view.

4.7 The hexagonal lamina of 25mm sides resting on one of its corners on HP. The lamina makes 45° with HP and the corner opposite to corner on which it rests is 25mm in front of VP and nearer to it, such that two of its sides are perpendicular to XY line in the top view. Draw its front view and top view.

4.8 A circular lamina of 50mm diameter rests on HP on a point A on the circumference, with its surface inclined at 45° to HP. The top view of the diameter passing through point A makes 60° to VP. Draw its front view and top view.

5.0 Projection of Solids

5.1 A square prism of base sides 30mm and 60mm axis length rests on HP on one of its base edges which is inclined at 30° to VP. Draw its projections when the axis is inclined at 45° to HP.

5.2 A square prism of base sides 30mm and 60mm axis length rests on HP on one of its base corners in such a way that the axis is inclined at 45° to HP. Draw its projections when the axis is inclined at 30° to VP.

5.3 A pentagonal prism of base sides 25mm and 60mm axis length rests on HP on one of its base corners such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections when the axis is inclined at 40° to HP and appears to be inclined at 45° to XY line.

5.4 A hexagonal prism of base sides 25mm and 50mm axis length rests on HP on one of its base corners such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections when the axis is inclined at 40° to HP and 30° to VP.

5.5 A triangular pyramid 30mm base edges and 50mm axis length rests on HP on one of its slant edges. Draw the projection of the pyramid when the axis is inclined to VP at 45°.

5.6 A square pyramid 30mm base edge and 60mm axis length rests on HP on one of its base corners such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections when the axis is inclined at 45° HP and top view of the axis makes 40° to XY line when the apex is nearer to the observer.

5.7 A pentagonal pyramid 30mm base edges and 60mm axis length rests on HP on one of its triangular faces. Draw the projections of the pyramid when the axis is inclined to VP at 45° and the base is nearer to the observer.

5.8 A hexagonal pyramid of base edge 25mm and height 50mm rests on HP on one of its base corners such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projections when the axis is inclined at 45°to HP and top view of the axis makes 40° to XY line when the apex is nearer to the observer.

5.9 A cylinder of base circle diameter of 40mm and 60mm axis length rests on HP on one of its base point on HP with its axis inclined at 45° to HP and top view of the axis is inclined at 30° to VP. Draw the projections.

5.10 A cone of base circle diameter of 40mm and 60mm axis length is resting on a base point on HP. Base makes 40° to HP. Draw the projection of the cone when the axis is inclined at 25° to VP.

6.0 Isometric Projection

6.1 A regular pentagonal prism of base edge 30mm and axis 60mm is mounted centrally over a cylindrical block of 80 mm diameter and 25mm thick. Draw isometric projection of the combined solids.

6.2 A cone of base diameter 40mm and height 50mm rests centrally over a frustrum of a pentagonal pyramid of base side 45mm, top side 35mm and height 55mm. Draw isometric projections of the combination of solids.

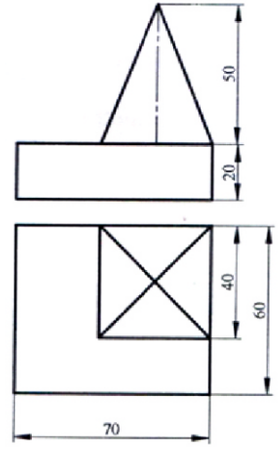
6.3 A hexagonal pyramid 30mm side and height 60mm rests on the center of the top of a square block of side 60mm and height 20mm. The base edge of the pyramid is parallel to the top edge of the square block. Draw the isometric projection of the combination of the solids.

6.4 The frustum of a square pyramid of sides of top face 20mm, bottom face 40mm and height 60mm rests centrally on top of a square block of side 60mm and height 20mm. The base edges of the pyramid are parallel to the top edges of the square block. Draw the isometric projection of combination of solids.

6.5 A sphere of diameter 60mm is placed centrally on the top face of a square prism side 60mm and height 70mm. Draw the isometric projection of the combination.

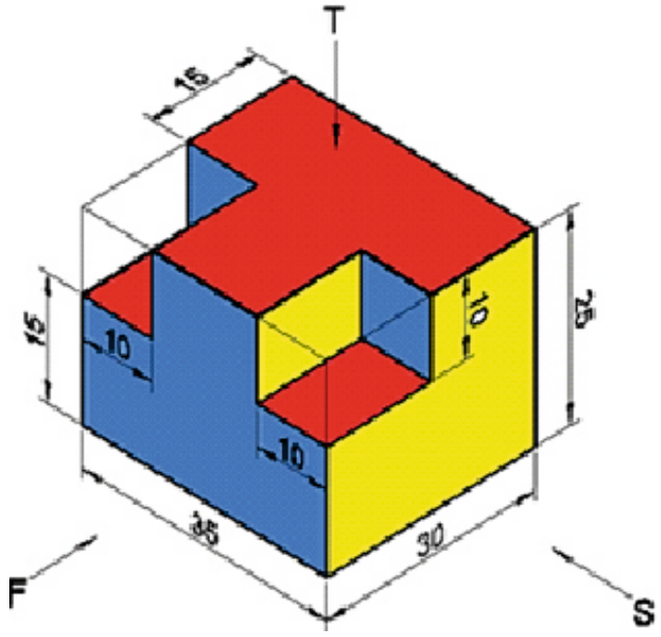
6.6 Draw the isometric projection of a hexagonal prism of side of base 40mm and height 60mm with a right circular cone of base 50mm diameter and height 60mm, resting on its top such that the axes are collinear.

6.7 Draw the isometric projection of the combination of solids shown in Figure 6.1.



7.0 Conversion of isometric to orthographic views (all dimensions in mm)

7.1



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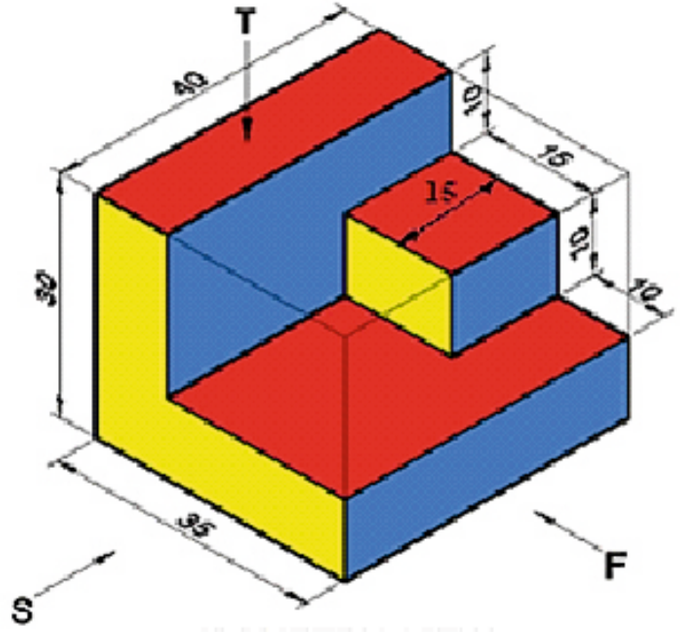

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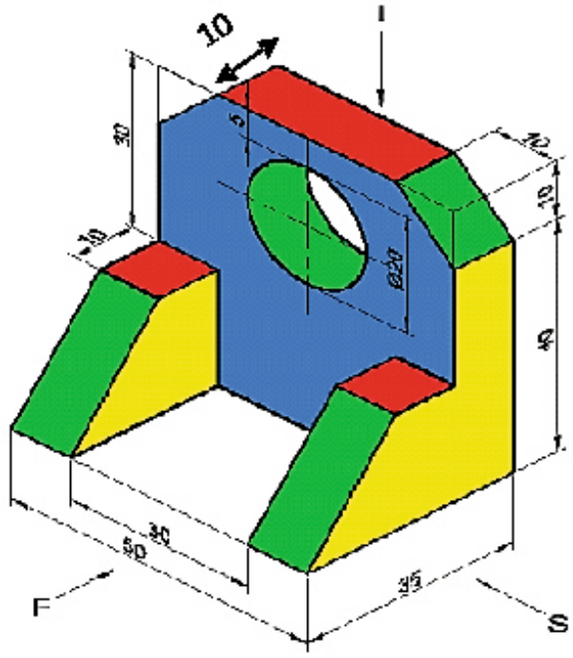

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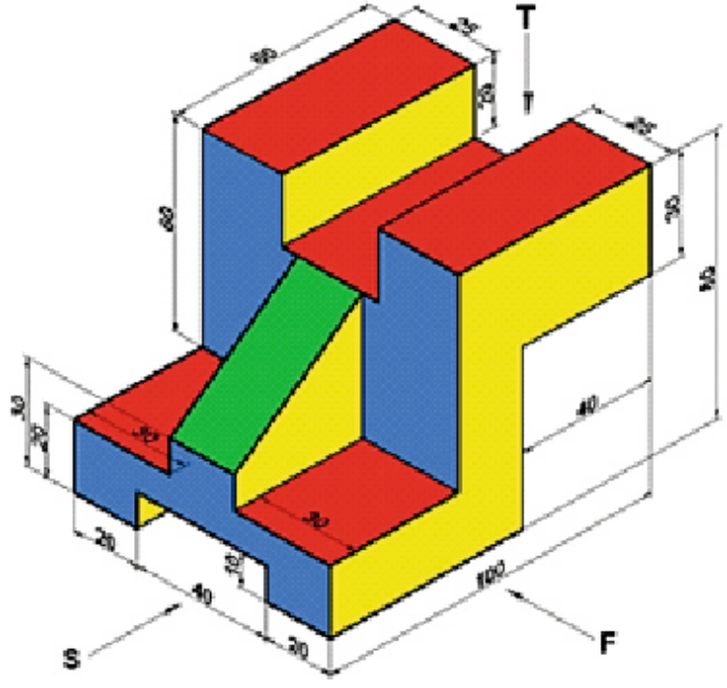

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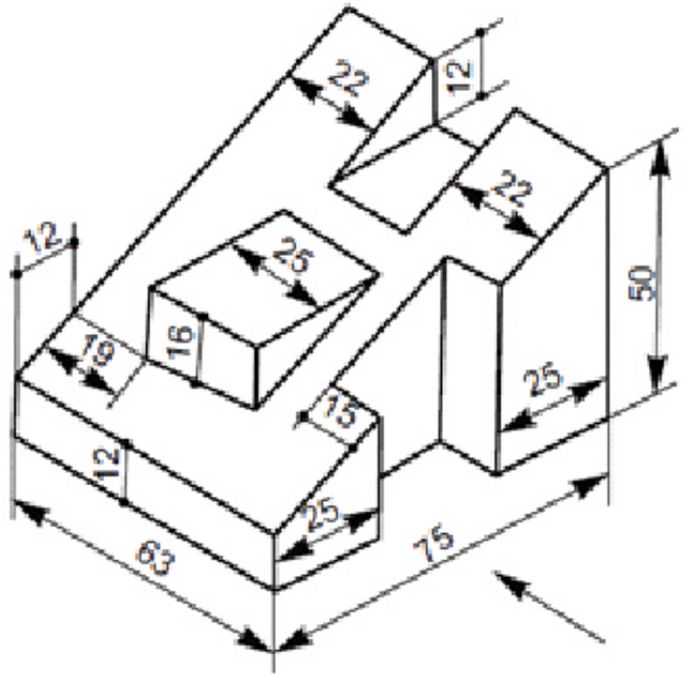
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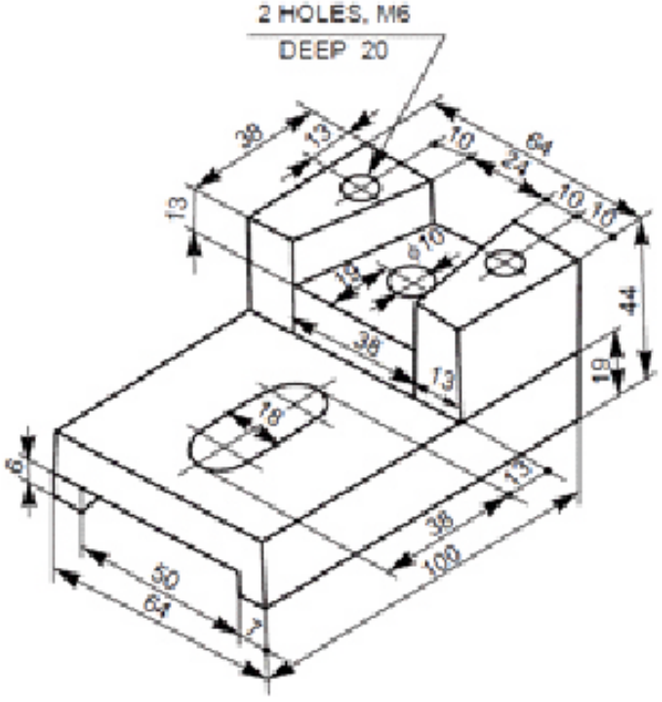
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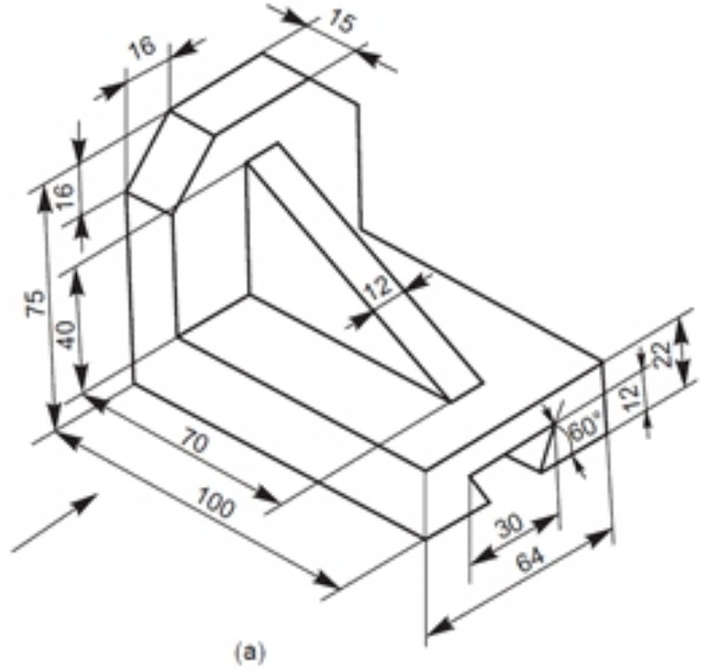
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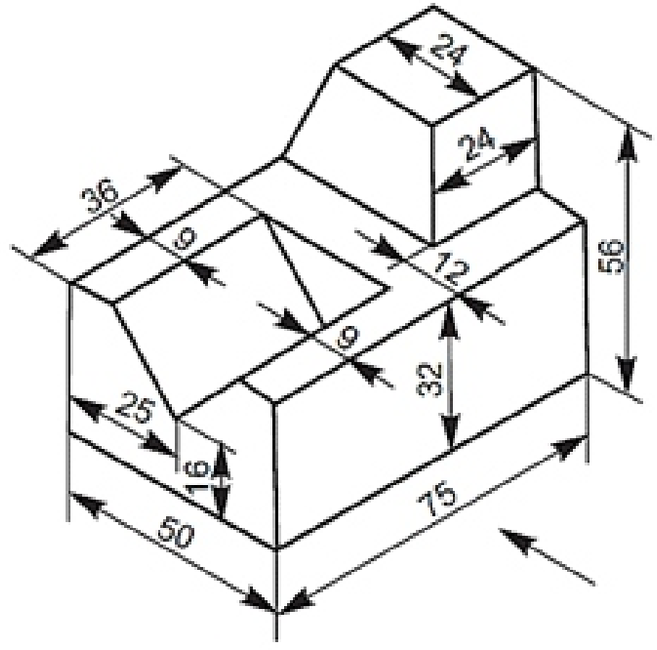
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8.0 Sectional front view along the mid plane

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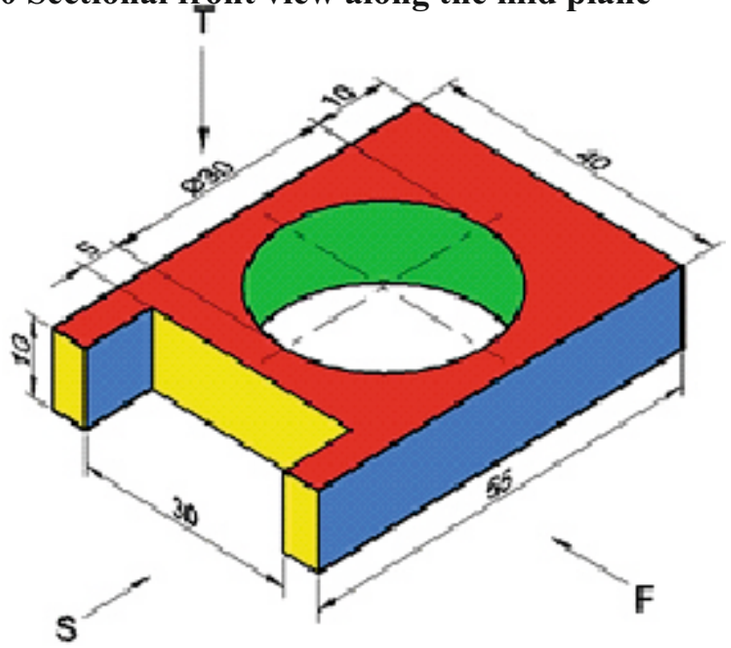
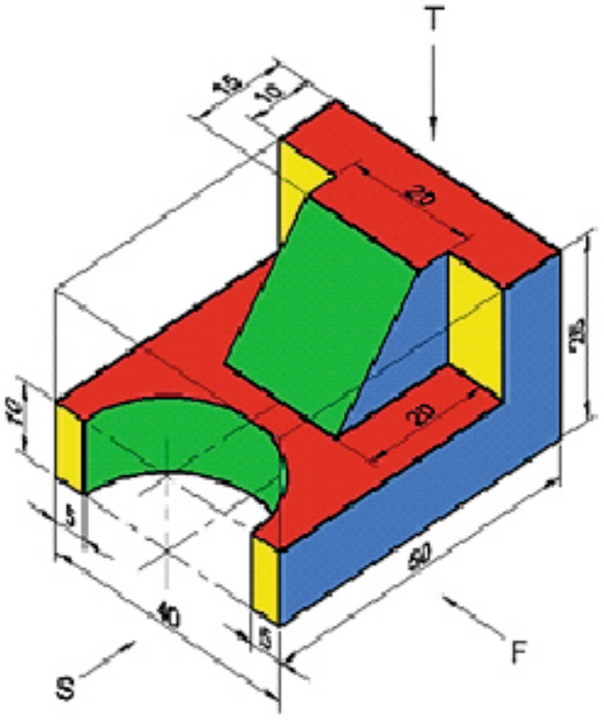


8.2



9.0 Development of surfaces (CAD)

9.1 A triangular prism of base edge 30mm and height 50mm rests on HP with its axis vertical and a base edge parallel to VP and farther from it. A section plane perpendicular to VP and inclined at 45° to HP bisects the axis of the prism. Draw the development of lateral surface of retained portion of the solid.

9.2 A square prism of 30mm base edges and 65mm axis length rests on HP with its axis vertical and two of its lateral surfaces are equally inclined to VP. A section plane perpendicular to VP and inclined at 45° to HP bisects the axis of the prism. Draw the development of lateral surface of retained portion of the solid.

9.3 A pentagonal prism of 30mm base edges and 65mm axis length rests on HP with two of its lateral surfaces are equally inclined to VP and nearer to it. A section plane perpendicular to VP and inclined at 45° to HP bisects the axis of the prism. Draw the development of lateral surface of retained portion of the solid.

9.4 A hexagonal prism of 30mm base edges and 60mm axis length rests on HP with its axis vertical and one of its lateral surfaces is inclined at 30° to VP and nearer to it. A section plane perpendicular to VP and inclined at 45° to HP bisects the axis of the prism. Draw the development of lateral surface of retained portion of the solid.

9.5 A triangular pyramid of base edge 30mm and height 50mm rests on HP with its axis vertical and two of its base edges equally inclined to VP and nearer to it. A section plane perpendicular to VP and inclined at 45° to HP bisects the axis of the pyramid. Draw the development of lateral surface of retained portion of the solid.

9.6 Draw the development of the lateral surface of a truncated cylinder, 40mm diameter of base and height 50mm, if the truncated flat surface of the cylinder bisects the axis at 60° to it.

9.7 The frustum of a square pyramid has its base 50mm sides, top face 25mm and height 40mm. Its axis is vertical and a side of base is parallel to VP. Draw the development of lateral surfaces.

9.8 A right cone of 50mm base diameter and 70mm height stands on its base on HP. It is truncated with its surface inclined at 45° to the axis lying at a distance of 40mm from the apex of the cone. Obtain the development of the lateral surface of the truncated cone.

9.9 A hexagonal prism side of base 30mm and height 60mm is cut as shown in the Figure 9.1 Draw the development of the lateral surface of the prism.

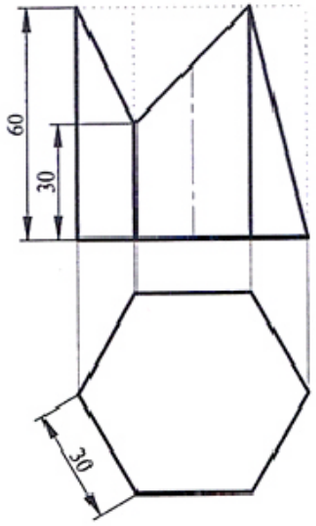


Figure 9.1

9.10 Draw the development of the lateral surface of the pyramid shown in Figure 9.2.

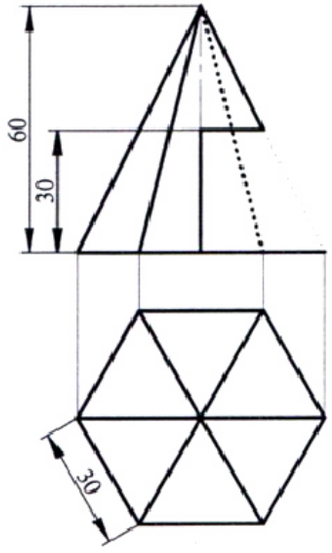
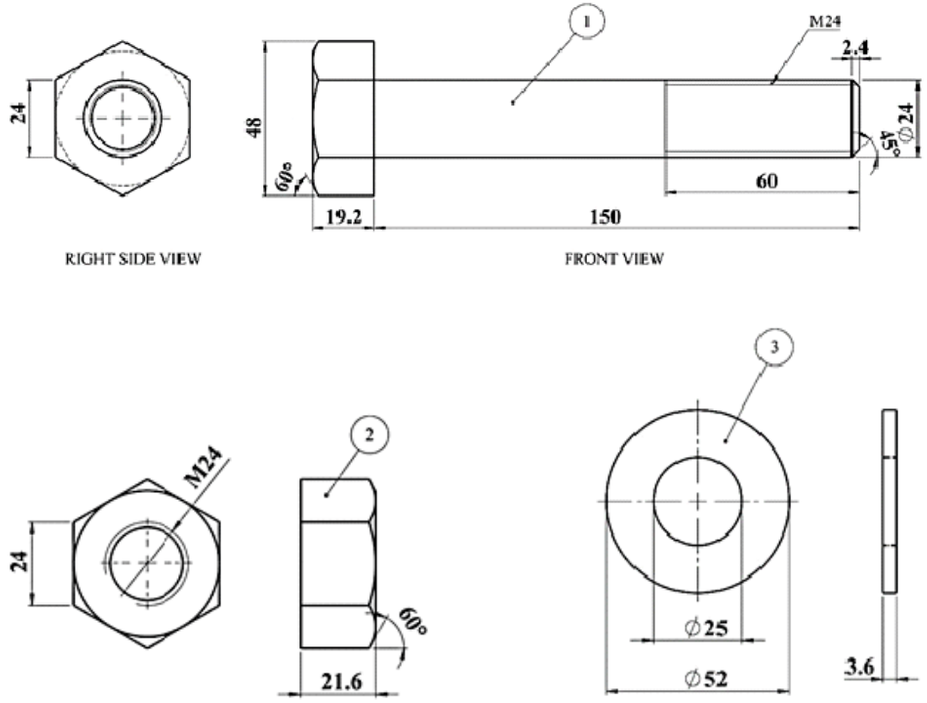


Figure 9.2

10.0 Engineering Components

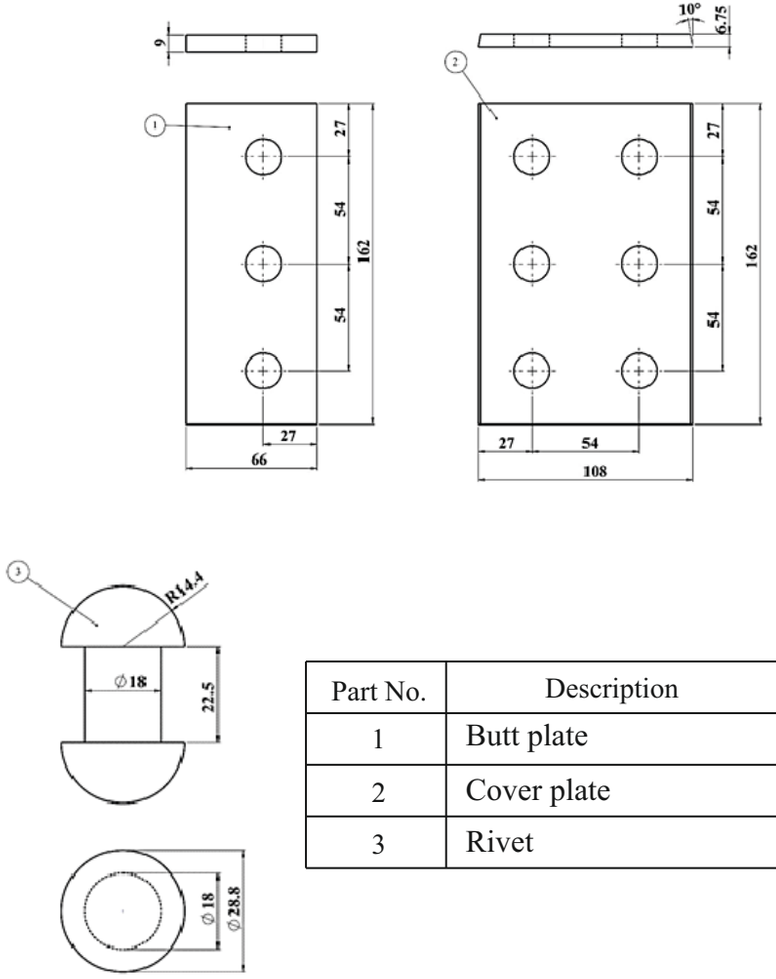
10.1 Create a 3D assembly model of Hexagonal headed bolt and nut with washer as shown in Figure 10.1. Generate front view, top view, left side view and isometric shaded model view.



Part No.	Description	Quantity
1	Hexagonal headed bolt	1
2	Hexagonal nut	1
3	Washer	1

Figure 10.1: Part drawings of hexagonal headed bolt and nut with washer

10.2 Create a 3D assembly of double riveted butt joint with double cover plate chain riveting as shown in Figure 10.2. Show three rivets in each row.



Part No.	Description	Quantity
1	Butt plate	2
2	Cover plate	2
3	Rivet	6

Figure 10.2: Part drawings of Single riveted butt joint with double cover plate.

11.0 Basic building drawing (Plan and Elevation): 2D

11.1 Draw single room plan of the building as shown in Figure 11.1. (Scale 1feet = 5mm)

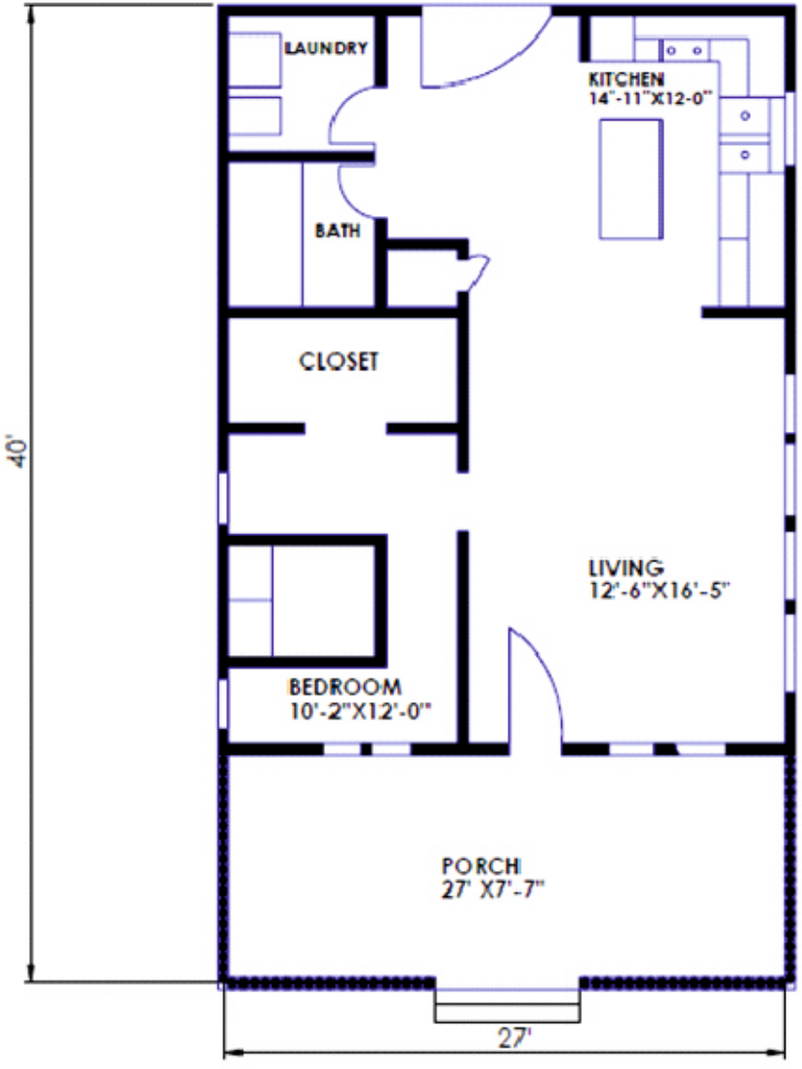


Figure 11.1: Details of single room plan

11.2 Draw the plan of two-storey building as shown in Figure 11.2. (Scale 1feet = 5mm)

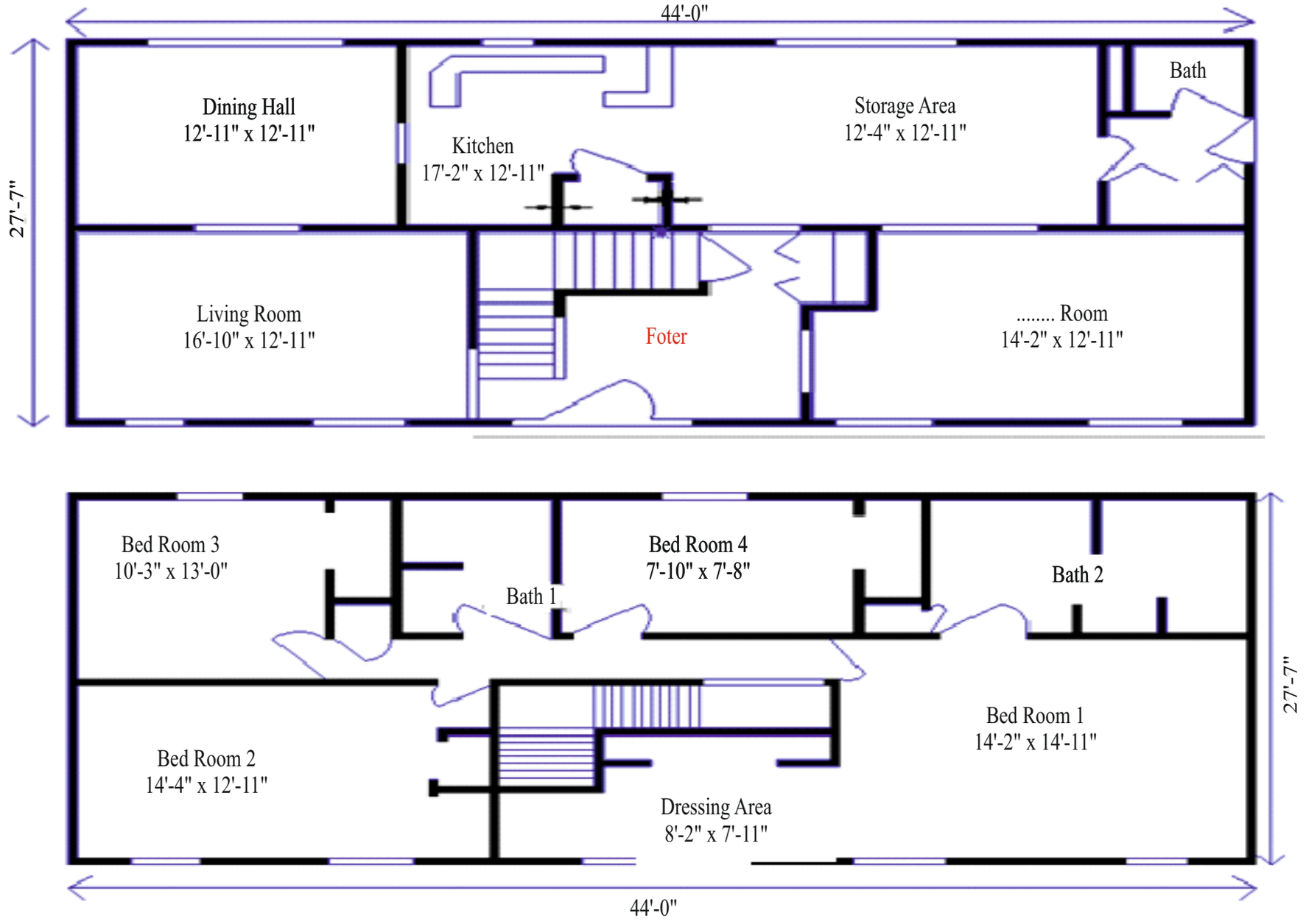


Figure 11.2: Details of Plan of Two-storey building

12.0 Electrical Drawings

12.1 Draw the electrical circuit diagram of a two-way control of lamp as shown in Figure 12.1

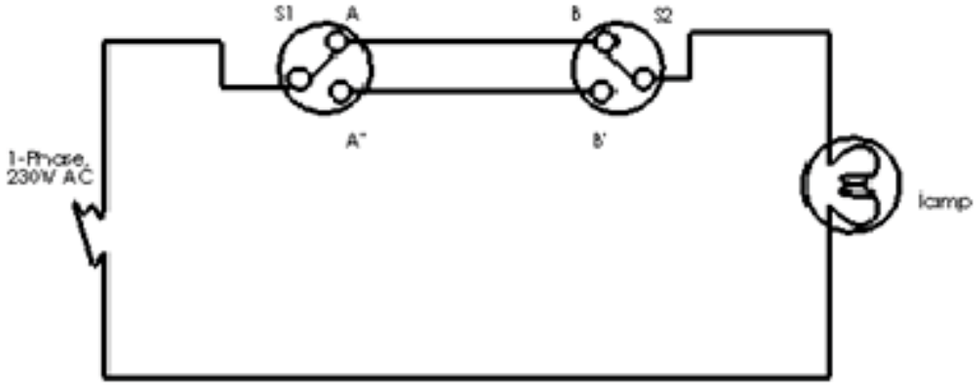


Figure 12.1: Circuit diagram of Two way control of lamp

12.2 Draw the electrical circuit diagram of three-way control of lamp as shown in Figure 12.2

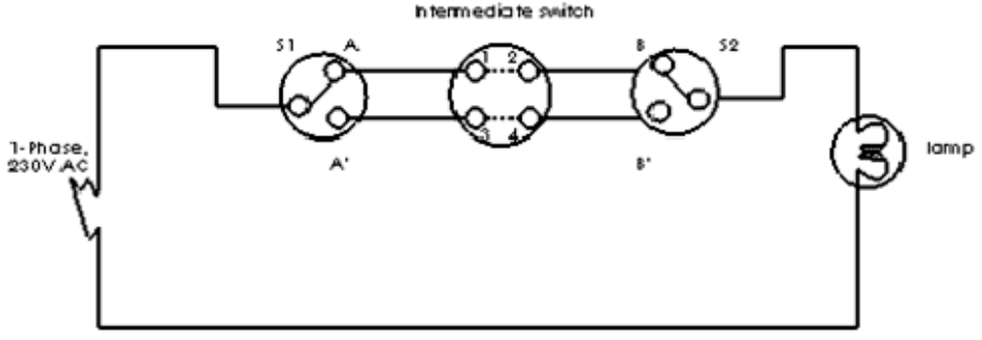


Figure 12.2: Circuit diagram of three-way control of lamp

12.3 Draw the electrical circuit diagram of Single Phase wiring diagram as shown in Figure12.3

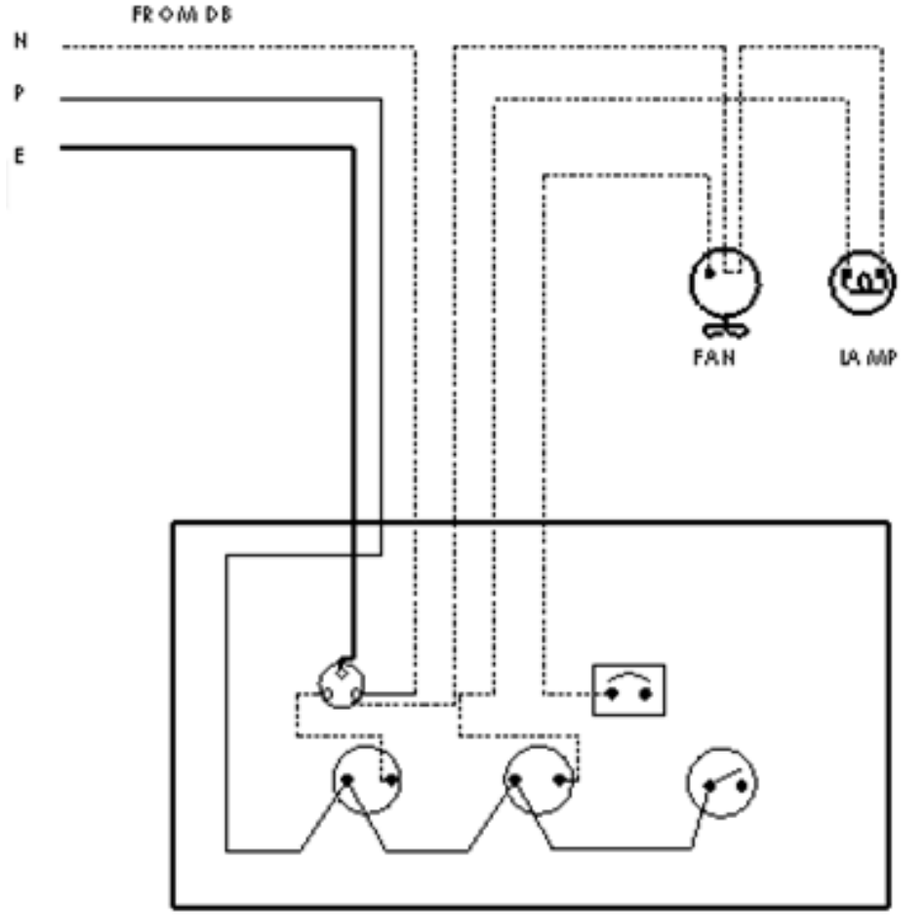


Figure 12.3: Single Phase wiring diagram

12.4 Draw the electrical circuit diagram of Single Line Diagram of 33 kV/11kVsubstation as shown in Figure 12.4

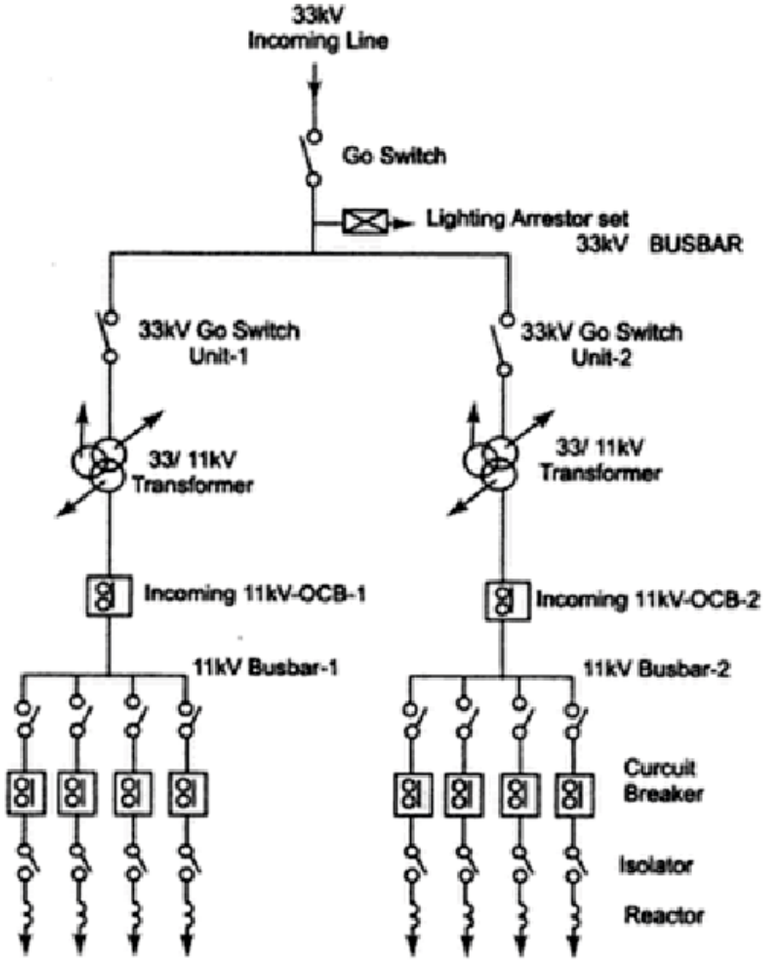


Figure 12.4: Line diagram of 33kV/11kV substation

12.5 Draw the electrical circuit diagram of 3-Phase Circuit substation as shown in Figure 12.5

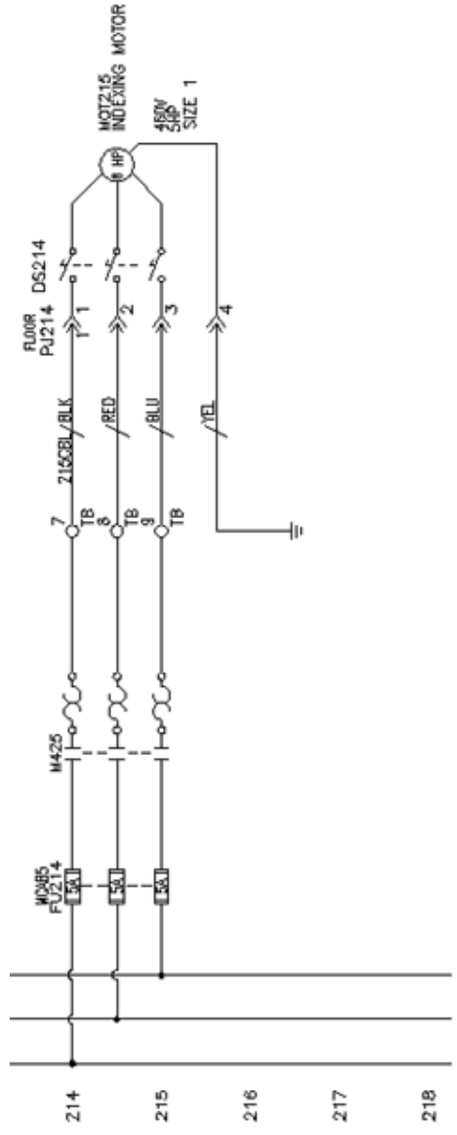


Figure 12.5: 3-Phase Circuit substation

13.0 Electronic PCB drawings: 2D

13.1 Draw electronic circuit diagram of a Positive Series Clipper as shownin Figure 13.1

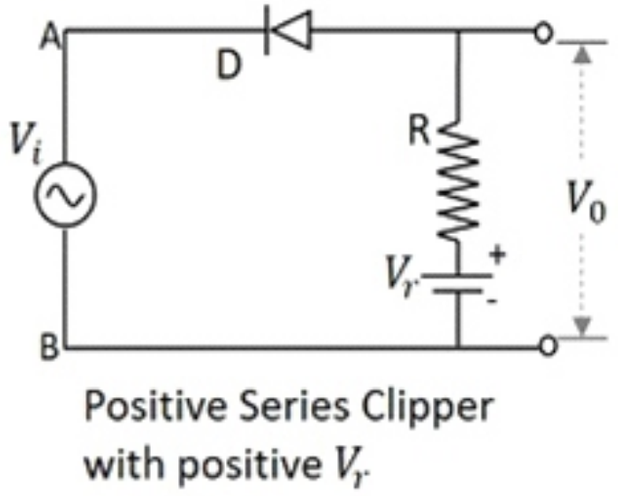


Figure 13.1: Circuit diagram of Positive series Clipper

13.2 Draw electronic circuit diagram of a Positive Clamper Circuit as shown in Figure 13.2

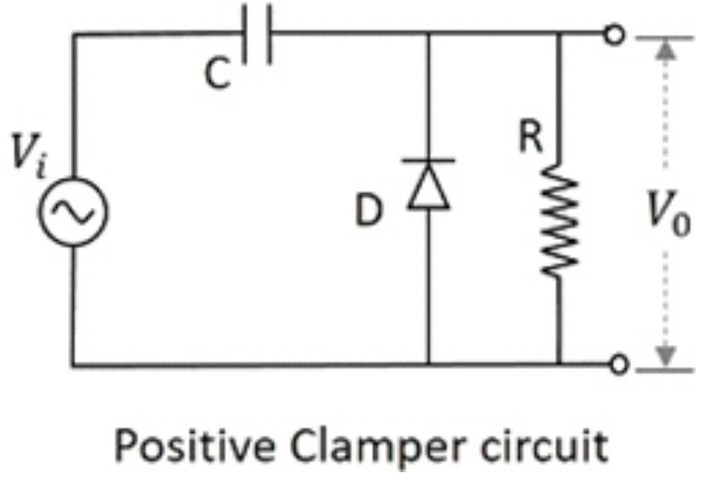


Figure 13.2: Circuit diagram of Positive Clamper Circuit

13.3 Draw electronic circuit diagram of a Full Wave Bridge Rectifier as shown in Figure 13.3

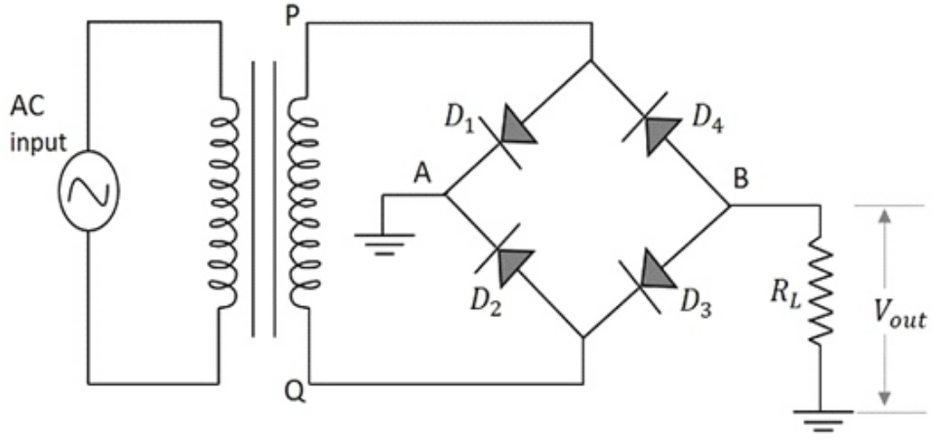


Figure 13.3: Circuit diagram of Full wave bridge Rectifier

13.4 Draw electronic circuit diagram of Center Tapped Full-Wave Rectifier as shown in Figure 13.4

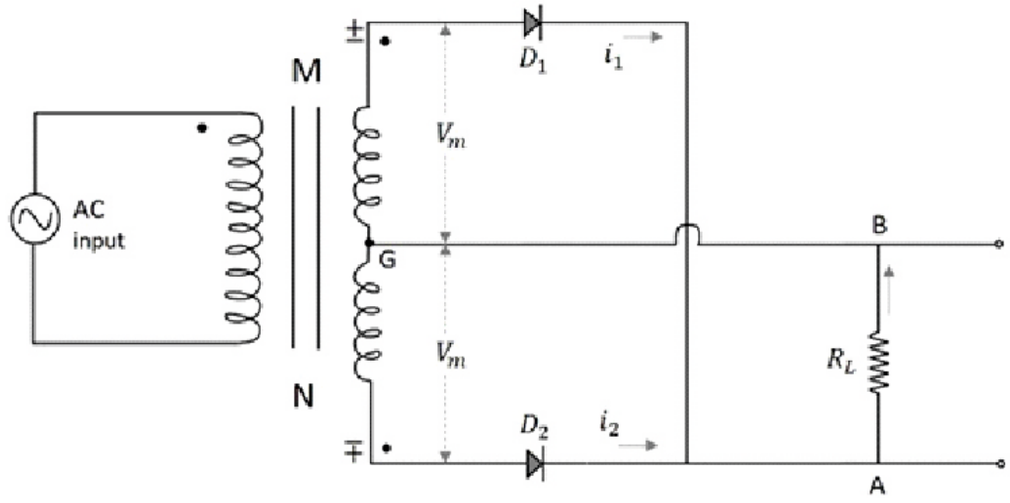


Figure 13.4: Circuit diagram of Center Tapped Full-wave Rectifier

13.5 Draw electronic circuit diagram of as shown in Inverting Amplifier Figure 13.5

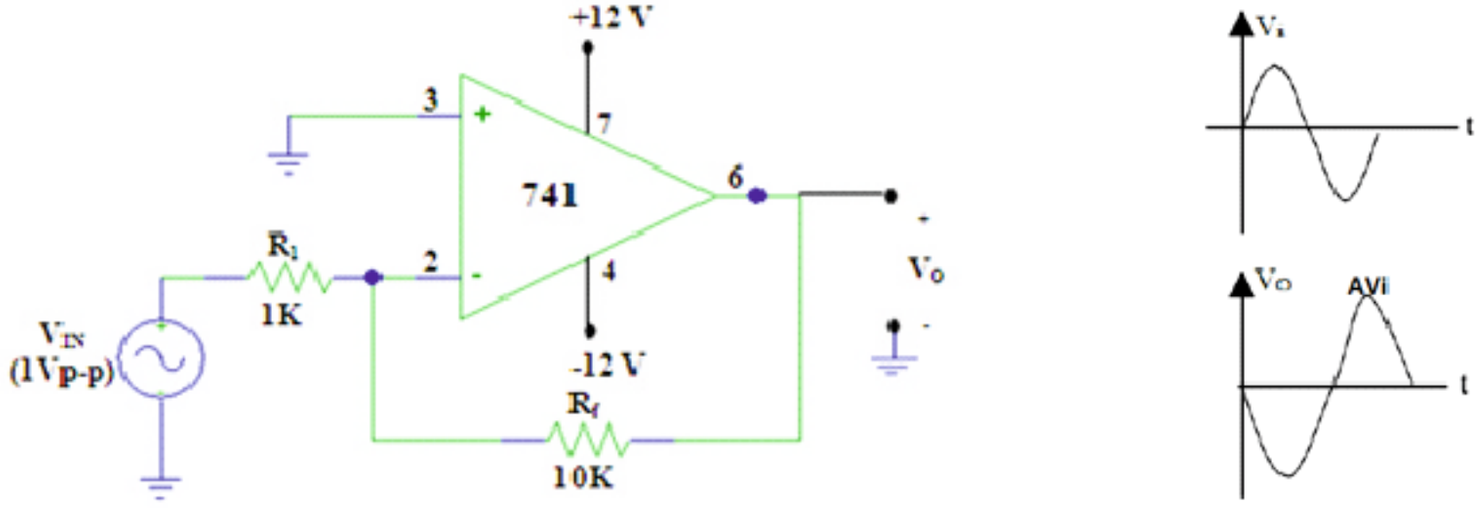


Figure 13.5: Circuit diagram of Inverting Amplifier

13.6 Draw electronic circuit diagram of Inverting Summer as shown in Figure 13.6

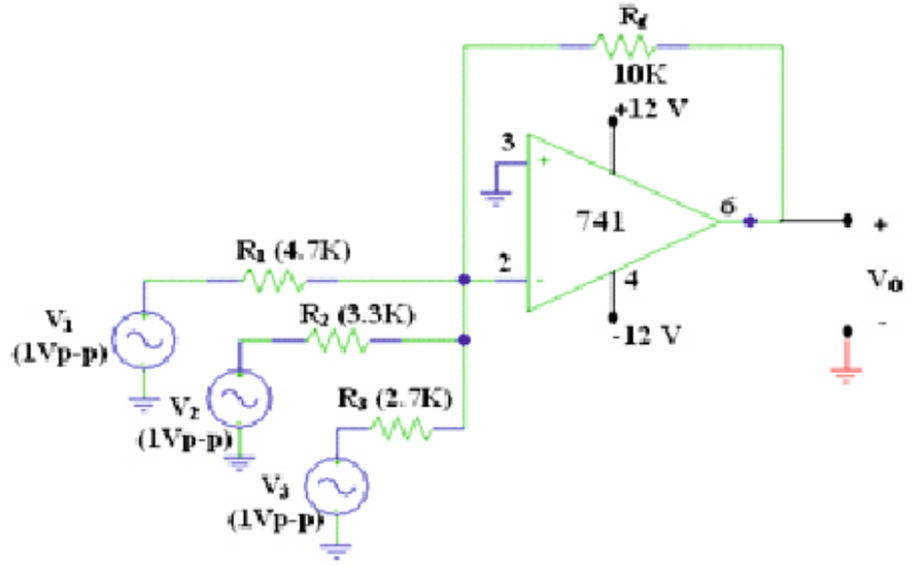


Figure 13.6: Circuit diagram of Inverting summer

13.7 Draw electronic circuit diagram of RC Coupled Amplifier as shown in Figure 13.7

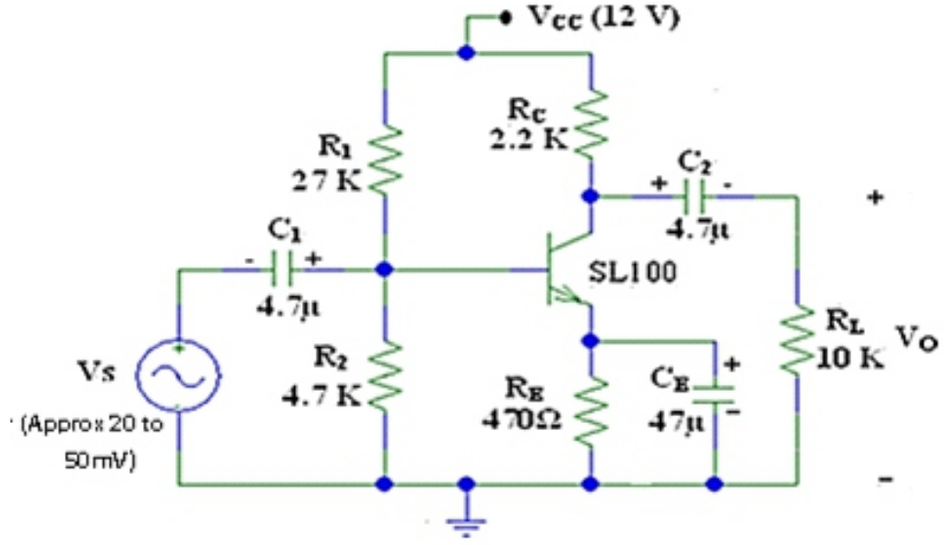


Figure 13.7: Circuit diagram of RC Coupled Amplifier