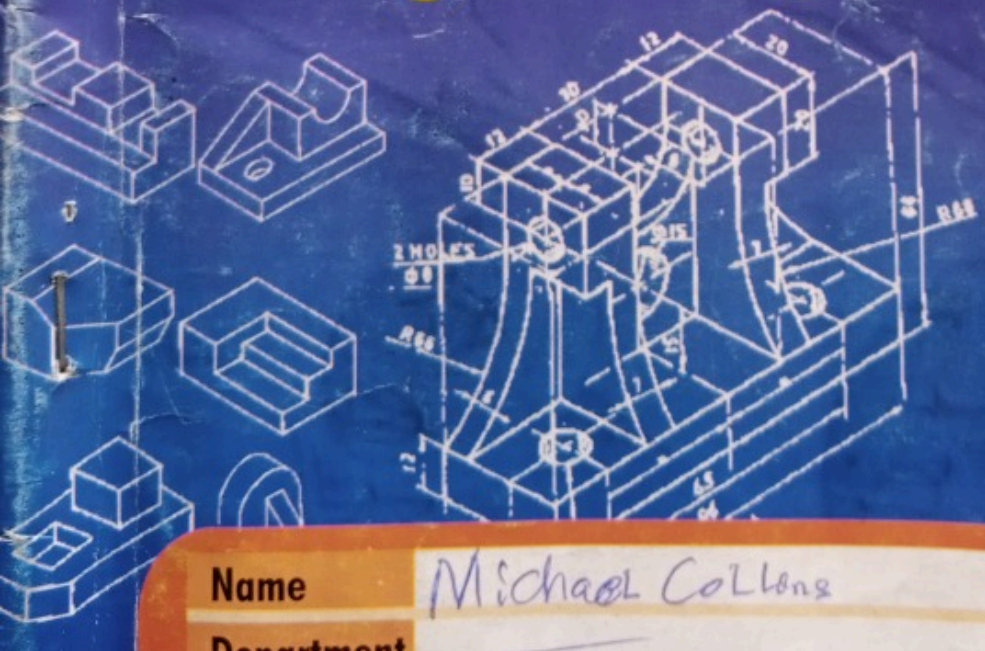
SURE A

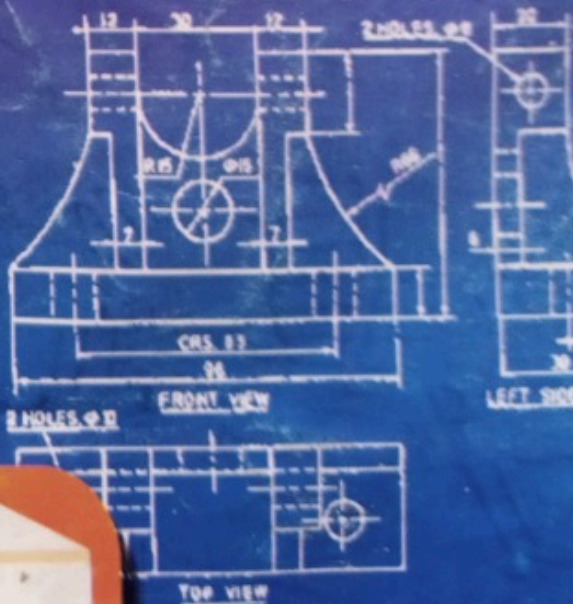
Learning is Good...But Practice is Better

COMPREHENSIVE LECTURE NOTE & PAST QUESTIONS & ANSWERS

ENG104

Engineering Drawing II





Name Michael Collins

Department

Phone No

Failure is not an option when success is a choice

Compiled By ACE

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ENG 104

TABLE OF CONTENTS

WHAT IS INNOVATION

1. Innovation is the introduction of new things, ideas or ways of doing something.
2. A new idea, way of doing something that has been introduced or discovered

➢ **SURE-A** in **ENG** 104 has the recent Innovation you need to secure your **SURE-A: BE INNOVATIVE**

Compiled by: C.C.E — 07038007946, 09028746251
Featuring: **ALUTTA** — 08169322880
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TEXT BOOKS USED

➢ Engineering Drawing (Geometrical Drawing) By P.S. Gill
➢ Elementary Engineering Drawing By N.D. Bhatt.
➢ A Foundation Course in Engineering Drawing Edited By S.N. Asoegwu & J.C Ezeh
➢ Engineering Drawing with Worked Examples 3rd Edition By M.A. Parker & F. Pick Up
➢ Technical Drawing For School Certificate and G.C.E By J.N Green

INTRODUCTION

ENG 104 is the course code for Engineering Drawing 2 which is the second phase of Engineering for year one student.

ENG 104 is a partial or type of drawing where most of the objects are drawn to three dimensional views (3D).

ENG 104 is a concept related course which revolves mainly around 45^0 and 30^0 160^0 set squares and also your compass.

ENG 104 is easy to draw but complex to interpret.

Every concept in ENG 104 revolve around two planes and these planes are known as

- Horizontal plane and.
- Vertical plane.

In ENG 104 , the terminologies common here are, projections, views (top side and front views), Isometric and oblique etc.

DRAWING INSTRUMENTS FOR ENG 104

1. Drawing Board
2. T. square
3. Set- Squares (30^0– 60^0 and 45^0)
4. A Drawing set
5. Drawing pencils (2H, H, HB, 2B [for thick lines])
6. French curves
7. Rubber eraser

LINES

ENG 104 Will not be understood without a proper understanding of line types and the uses.
First: What is a Line?

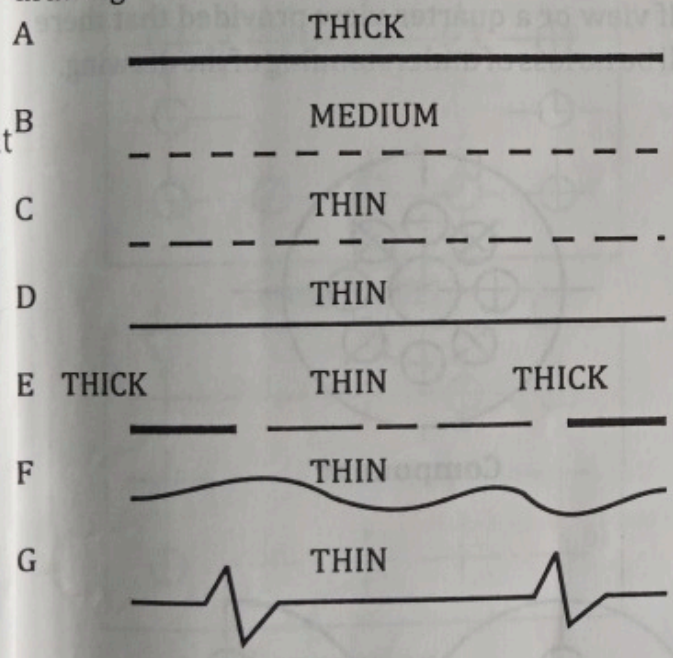
LINE

A line is a one-dimensional figure extending definition at both ends having no thickens and width.

You see, from these definition, let us take a quick reminder of line types.
Are you following: ok that is good.

TYPES OF LINES

Various types of lines are used in Engineering drawing:



OUTLINES: Lines drawn to represent visible edges and surface boundaries of objects are outlines or principal lines. They are continuous thick lines (A)

DASHED LINES: Interior or hidden edges and surfaces are shown by dashed lines. They are also called dotted lines. They are of medium thickness (B) and made up of short dashes of approximately equal lengths of about 2mm spaced at equal distances of about 1mm.

CENTRE LINES: Centre lines are drawn to indicate the axes of cylindrical, conical or spherical objects or details, and also to show the centres of circles and arcs. They are thin and long chain lines (c) composed of alternately long and short dashes spaced approximately 1mm apart.

DIMENSION LINES: These lines are continuous thin lines (D). They are terminated at the outer ends by pointed arrowheads touching the outlines, extension lines or centre lines.

EXTENSION LINES: These lines also are continuous thin lines (D) They extend by about 3mm beyond the dimension lines.

CONSTRUCTION LINES: These lines are drawn for construction figures. They are shown in geometrical drawing only. They are continuous thin lines (D)

HATCHING OR SECTION LINES: These lines are drawn to make the section evident. They are continuous thin lines (D) and are drawn at an angle of 45^0 to the main outline of the section. They are uniformly spaced about 1mm to 1.5mm apart.

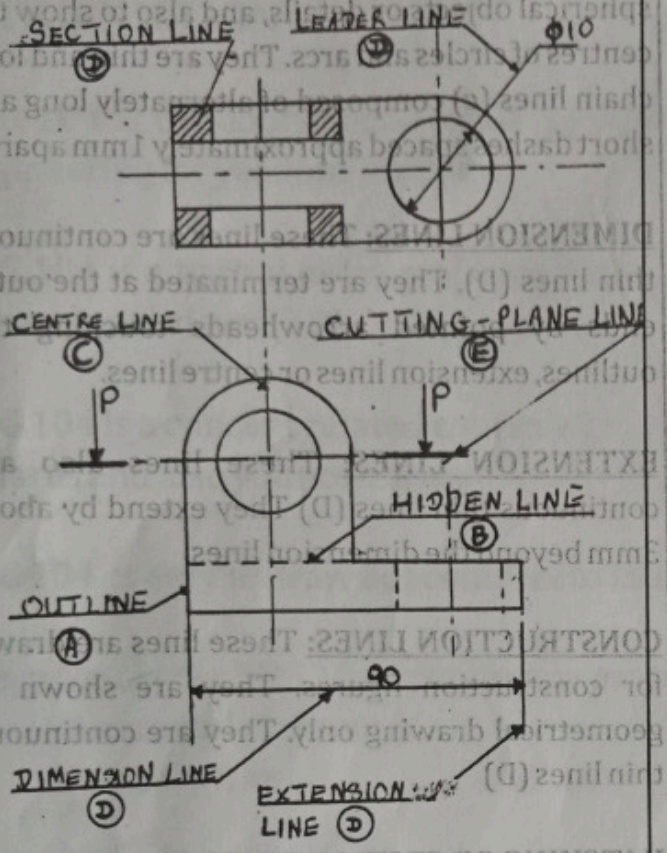
LEADER OR POINTER LINES: Leader line is drawn to connect a note with the feature to which it applies. It is a continuous thin line (D)

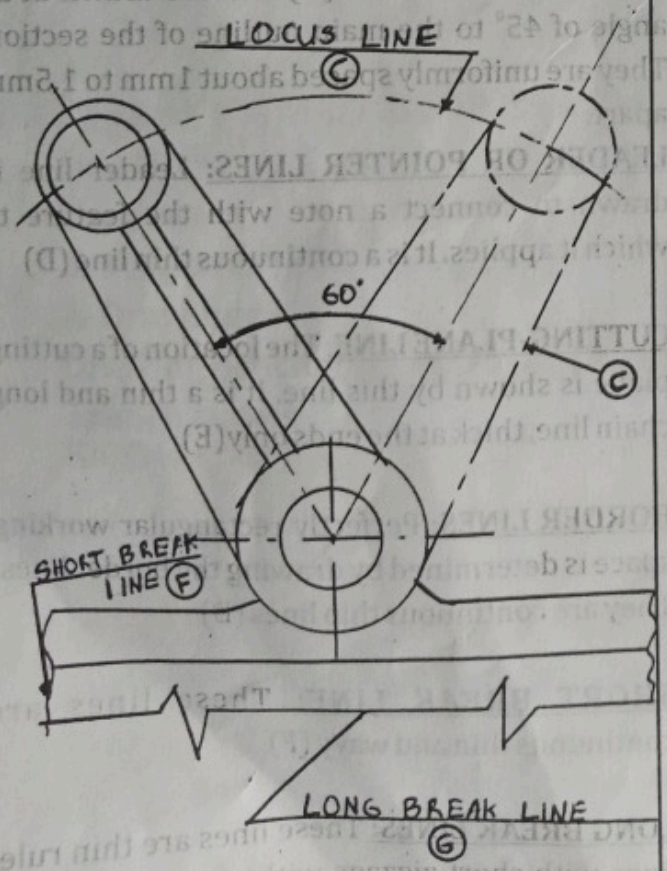
CUTTING-PLANE LINE: The location of a cutting plane is shown by this line. It is a thin and long chain line, thick at the ends only (E)

BORDER LINES: Perfectly rectangular working space is determined by drawing the border lines. They are continuous thin lines (D)

SHORT BREAK LINE: These lines are continuous thin and wavy (F)

LONG BREAK LINES: These lines are thin ruled lines with short zigzags within them (G). They are drawn to show long breaks.





CONVENTIONS

Conventions are lines and symbols used in engineering drawing to represent certain features so that time and space may be saved.

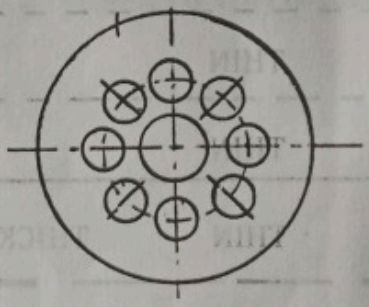
TYPES OF CONVENTION

The following are some of the frequently used conventions in engineering:-

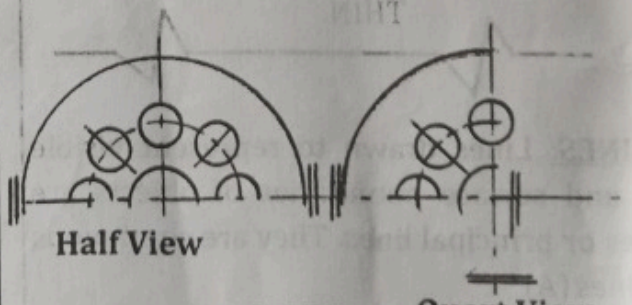
i. Symmetry
ii. Enlarged part view
iii. Repetitive Information
iv. Removed views

SYMMETRY

When symmetry about a centre line, or an axis exists the component may be represented by a half view or a quarter view provided that there will be no loss of understanding of the drawing.



Component



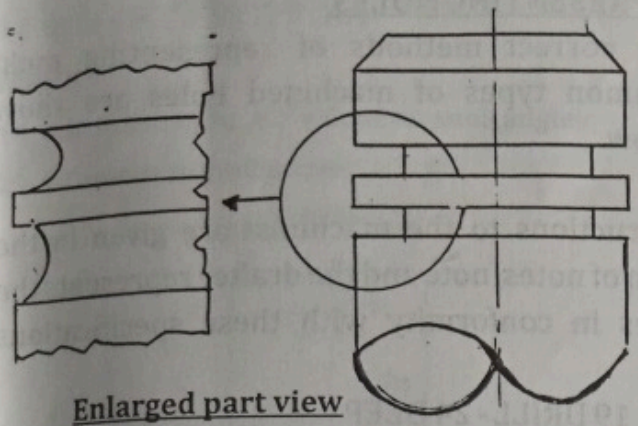
Half View

Quart View

CONVENT

ENLARGED PART VIEW

If there are features on a component which ar too small to be dimensioned evenly, the feature are enclosed in a thin circle and their enlarge part views drawn.

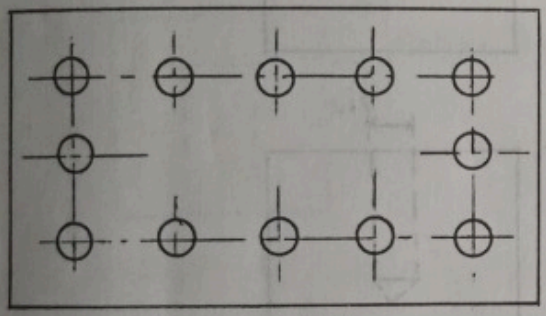


Enlarged part view

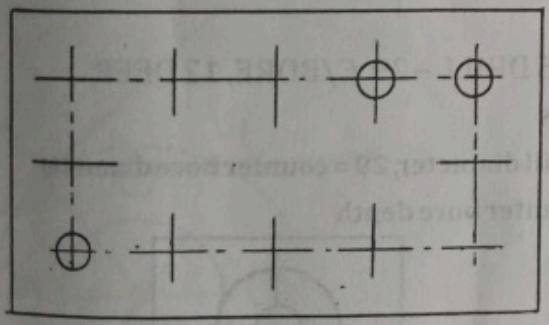
Component

REPETITIVE INFORMATION

When identical features appear many times on a drawing, we draw one and indicate the position of others using their centre lines.



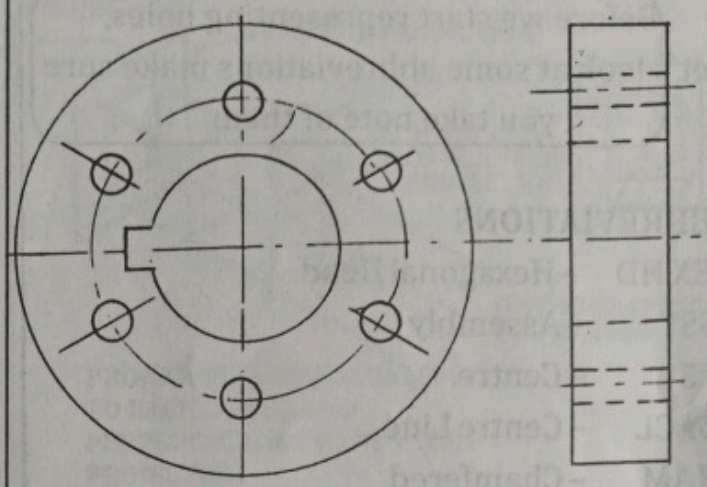
Component



Convention

REVOLUTION CONVENTIONS

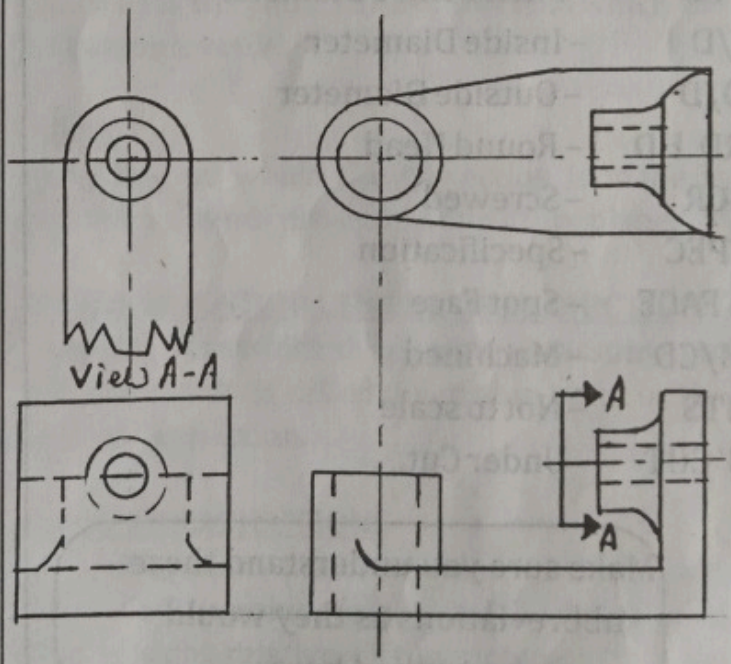
In this case the component is revolved so that each feature lies along the vertical centre line from where it is projected to the correct side view.



Revolution Conventions For Circular Rid

REMOVED VIEWS

A removed view is a complete or partial view removed to another place on the sheet so that it no longer is in direct projection with



Removed View

REPRESENTING HOLES

Before we start representing holes, let's look at some abbreviations make sure you take note of them

ABBREVIATIONS

HEX HD – Hexagonal Head.
ASSY – Assembly
CRS – Centre
Z or CL – Centre Line
CHAM – Chamfered
CH HD – Cheese Head
CSK – Counter Sunk
C/BORE – Counter Bore
DIA – Daimler (in a note)
Ø – Diameter (Preceding a Dimension)
DRG – Drawing
MATL – Material
R – Radius (Preceding a Dimension)
PCD – Pitch Centre Diameter
I/D – Inside Diameter
O/D – Outside Diameter
RD HD – Round Head
SCR – Screwed
SPEC – Specification
S'FACE – Spot Face
M/CD – Machined
NTS – Not to scale
U' CUT – Under Cut.

Make sure you understand these abbreviations as they would be applied here.

REPRESENTING HOLES

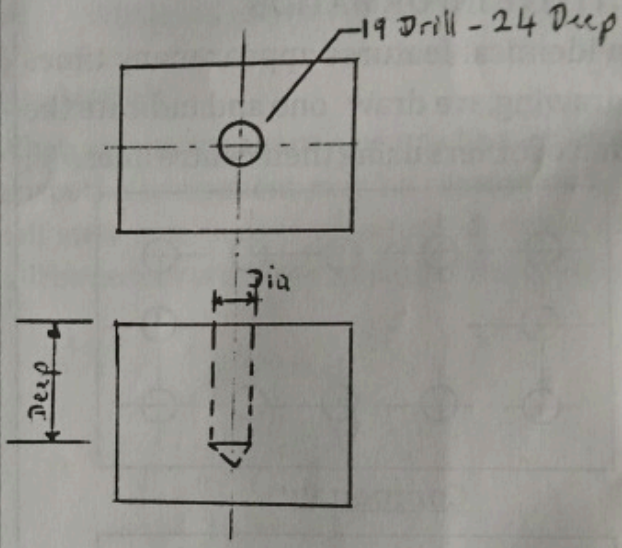
The correct methods of representing mo common types of machined holes are sho below.

Instructions to the machinist are given in th form of notes, note and the drafter represents th holes in conformity with these specificatio like:

a. 19 DRILL - 24 DEEP

Means

19 = drill diameter and 24= drill depth

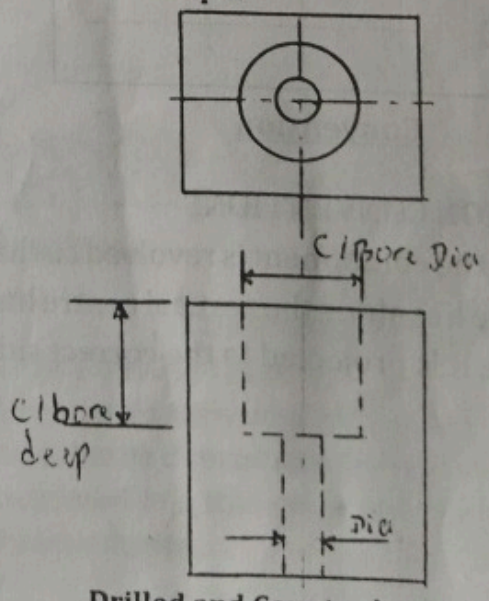


b). 15 DRILL – 29 C/BORE, 12 DEEP

Means

15 = drill diameter, 29 = counter bore diameter

12 - counter bore depth



Drilled and Counter bore hole

14 drill – 8
Means
14 = drill di
29 = Counte

d). 16 dr
Means
16 = drill di

enting most
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pecifications

24 Deep

P

meter

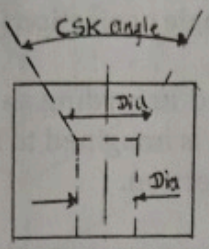
e

14 drill – 82° CSK, 29 DIA

Means

14 = drill diameter, 82° = Counter sunk angle

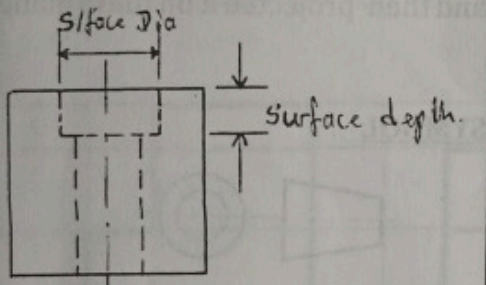
29 = Counter sunk diameter

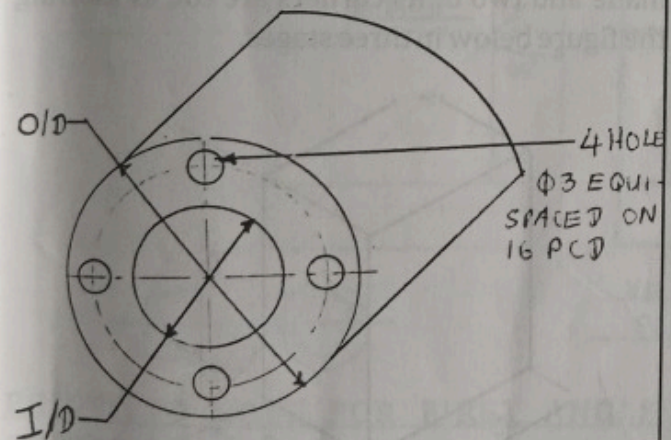


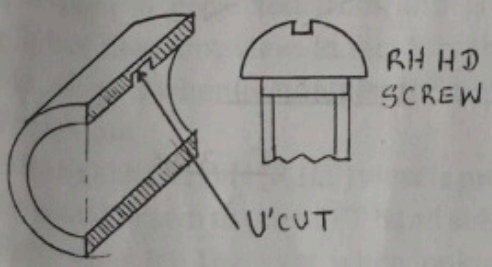
d). 16 drill – 32 space

Means

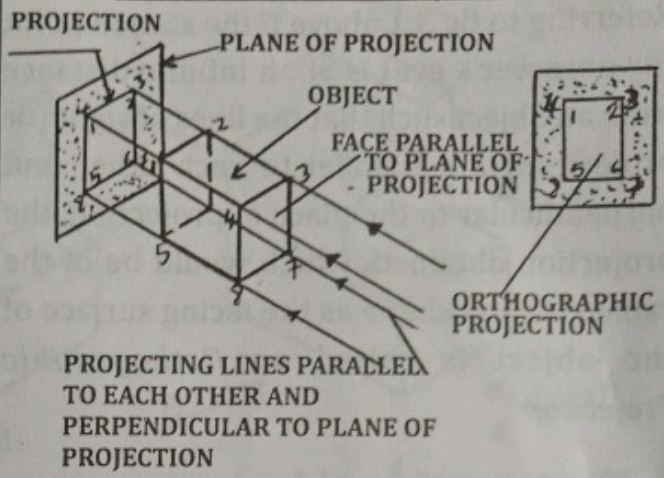
16 = drill diameter, 32 = spot face diameter







ORTHOGRAPHIC PROJECTION



PROJECTION TERM

PROJECTION

In graphic language the shape is describe by projection. "Projection" is the image of the object, formed by rays of light, taken in some particular direction, from the object into a picture plane, as it appears to an observe stationed at the point, from or towards which the projection is made.

PLANE

The plane, on which the projection is made is called the plane of projection or picture plane.

STATION POINT OR CENTRE OF PROJECTION

The point from which the observer is assumed to view the object, is called the station point or the centre of projection.

TYPES OF PROJECTIONS

Depending upon the orientation of the object, location of the point of sight, and the direction of lines of sight relative to the picture plane, the different types of projections that can be obtained are:

i. Perspective Projection
ii. Parallel Projection
iii. Orthographic Projection
iv. Axonometric Projection
v. Oblique etc.

ORTHOGRAPHIC PROJECTION

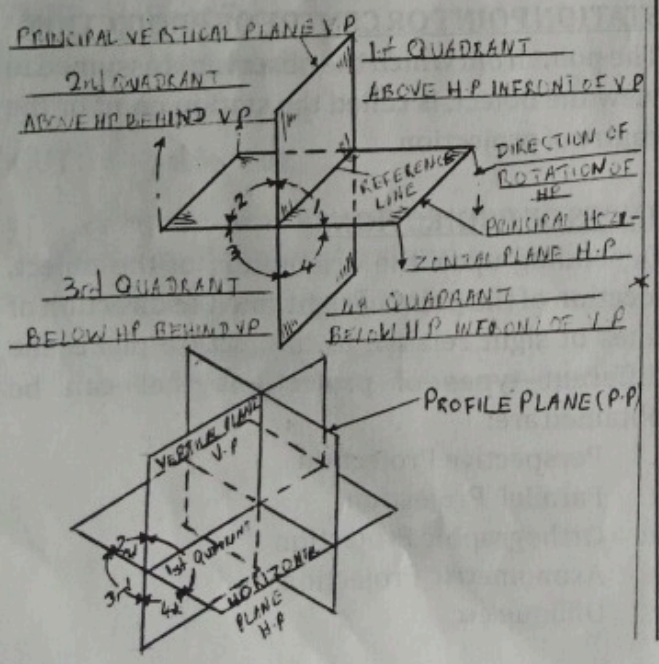
Referring to fig 3.1 above if the station point (or observer's eye) is at an infinite distance from an object such that the lines of sight (or projectors) are parallel to each other and perpendicular to the place of projection, the projection obtained, which would be of the same size and shape as the facing surface of the object is called an *Orthographic Projection*

CO-ORDINATE PLANES OF PROJECTION

In the orthographic projection drawing three main planes are usually used, which are.

i. Vertical plane (VP) or Frontal plane (FP)
ii. Horizontal plane (HP)
iii. Profit plane (PP) set up perpendicular between (VP) and HP

The horizontal and vertical planes which are called the principal planes, divide the while space on one side of the profit plane into four parts called the four dihedral angles (or quad rants).



SYSTEMS OF ORTHOGRAPHIC PROJECTION

Orthographic vices of any object can b represented by any one of the two systems projection, e.g

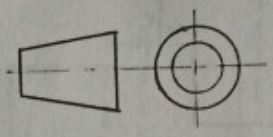
- The first Angle projection (European) and
- The third Angle projection (American)

These are named according to the quadrant which the object is imagined to be placed, for th purposes of projection.

FIRST ANGLE ORTHOGRAPHIC PROJECTION

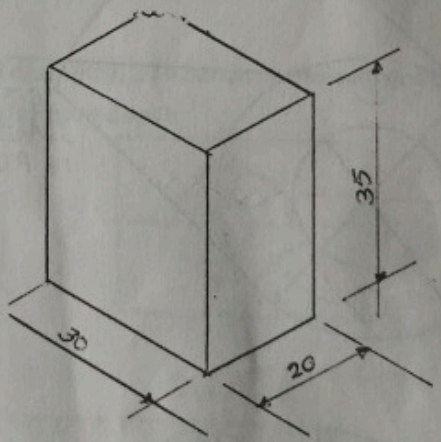
From the four dihedral angles (or quadrant) w have assumed the object to be situated in front the V.P and above the H.P i.e in the first quadra and then projected it on these planes.

SYMBOL



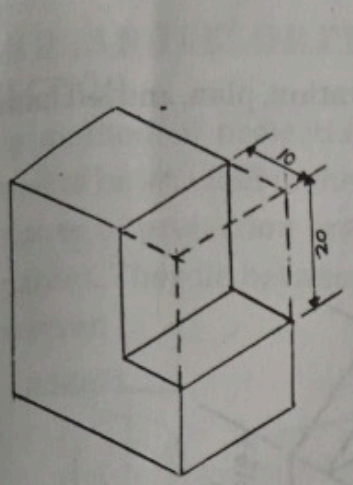
FIRST ANGLE PROJECTION SYMBOL

Assume that a small block, 20x35x30mm, made and two of its corners are cut, as showin the figure below in three stages.

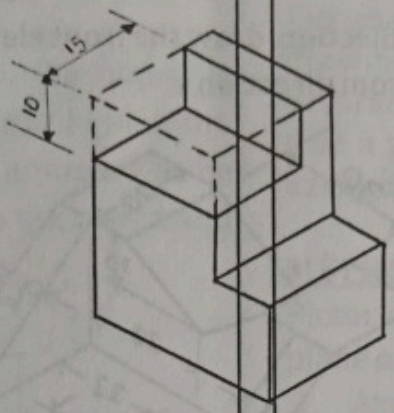


STAGE-1

Fig 3.3a



STAGE-2
Fig 3.3b



STAGE-3
Fig 3.3c

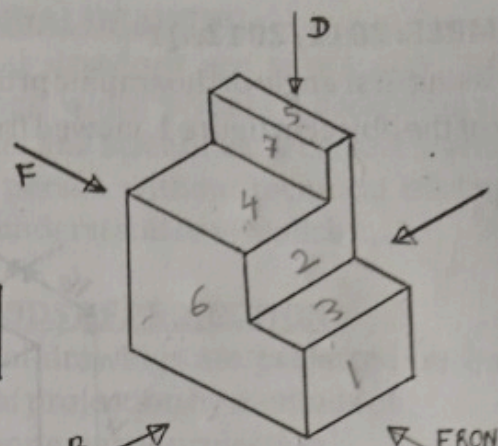
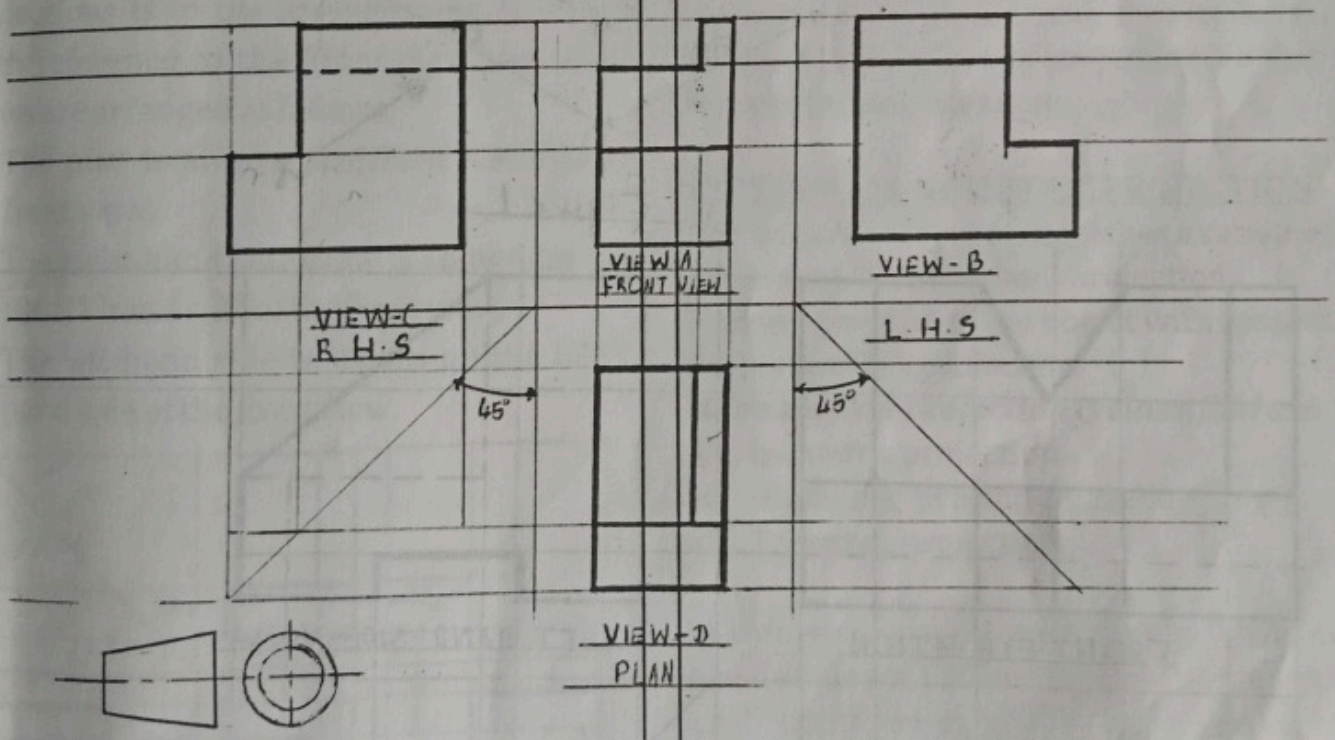


Fig 3.3d

E BLOCK ARRANGED IN AN ARBITRARY VIEW



POINTS TO NOTE FOR FIRST ANGLE ORTHOGRAPHIC PROJECTION

1. The plan is projected from and is drawn BELOW the front view. In fact it is the view that is seen when looking on the top of the Front view.
2. The right hand side (R.H.S) view is projected from and drawn to the LEFT hand side of the Front view. It is that view when looking from right hand side of the front view.
3. The left hand side (L.H.S) view is projected from and drawn to the RIGHT of the Front view. It is the view seen when looking from the left hand of the front view.
4. Decide which face of the component is to be drawn as the Front view. Although the choice is to a large extent arbitrary, it is necessary to note that the Front view should, ideally, be the one providing most information about the shape of the component.

EXAMPLE: 2011/2012. Q1

Q1). Using first angle orthographic projection, draw the front elevation, plan, and left hand side view of the object in figure 1, viewed from direction x.

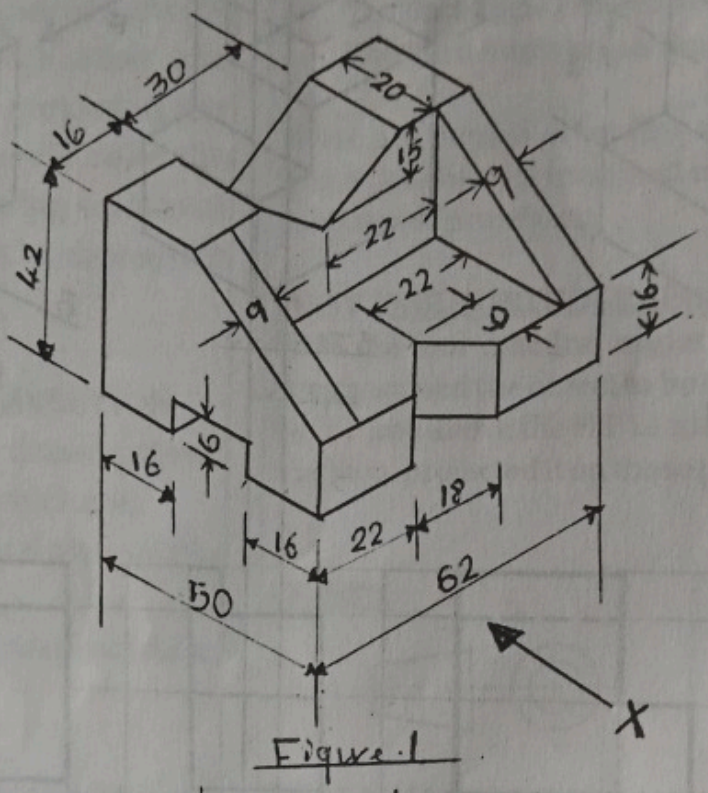
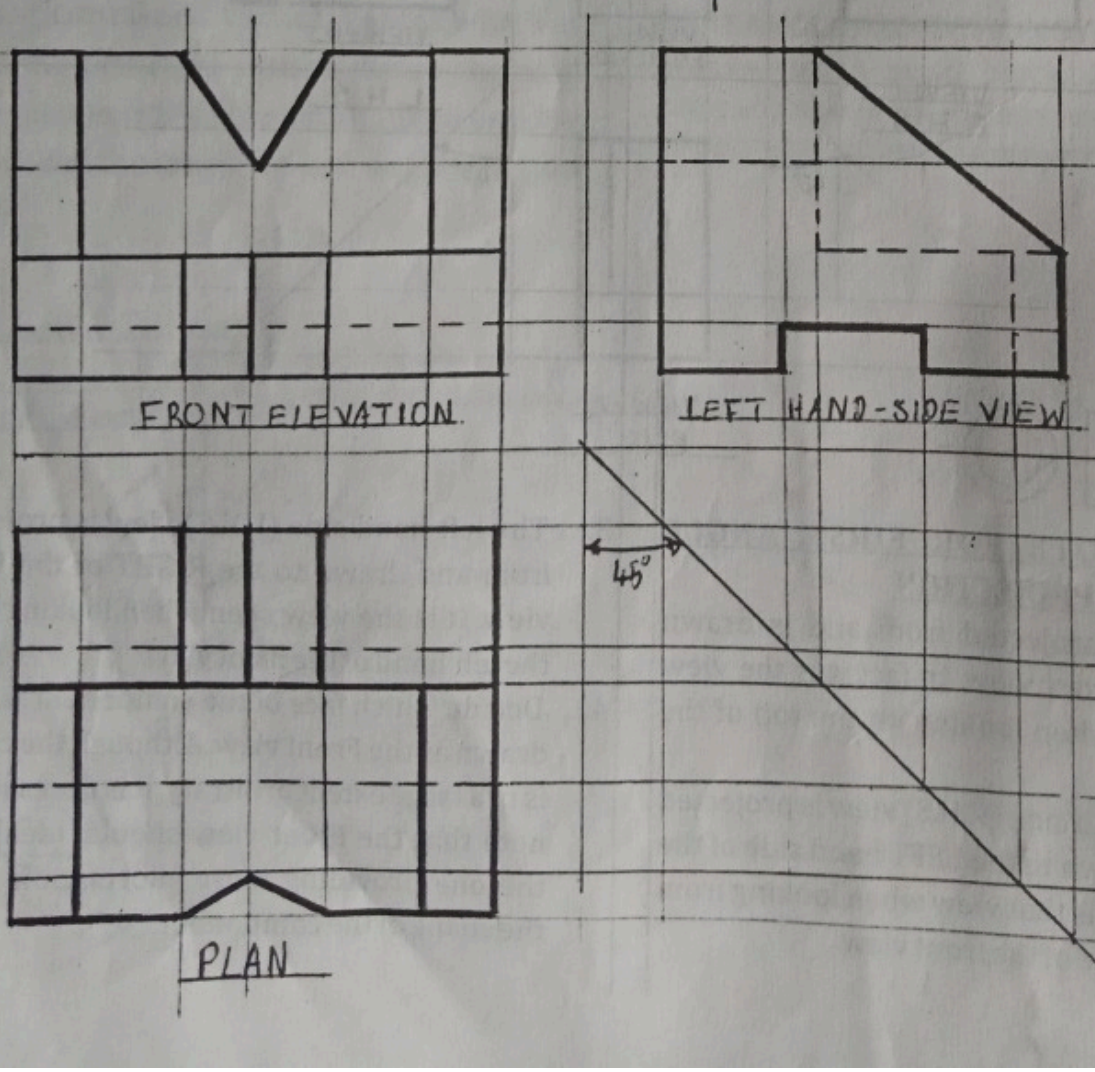
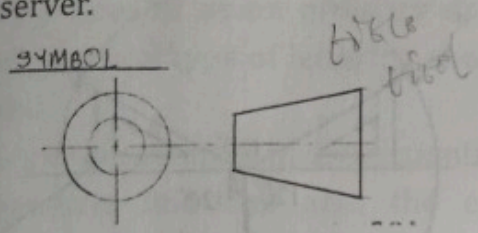


Figure 1



THIRD ANGLE ORTHOGRAPHIC PROJECTION

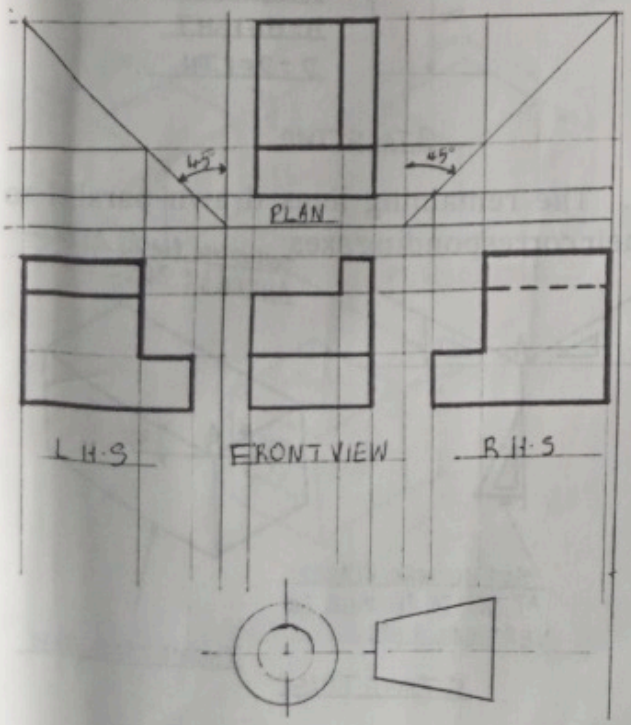
In this method of projection, the object is assumed to be situated in the third quadrant. The planes of projection are assumed to be transparent. They lie between the object and the observer.



THIRD ANGLE PROJECTION SYMBOL

The difference between first and third angle projections is in the arrangement of views. With reference to the Front view the other views are arranged as follows.

i. The plan is always projected ABOVE the front view.
ii. The right hand side view is shown on the RIGHT hand side of the front view.
iii. The left hand side is shown on the LEFT hand side of the front view.



PICTORIAL DRAWING

Pictorial drawings are single view picture drawings, which present a design idea in an accurate and scientifically correct manner so that a person without technical trading can easily understand or visualize it.

METHODS OF PROJECTION

Pictorial drawings are projected on a single plane of projection by methods of:

1. Axonometric projection
2. Oblique projection, and
3. Perspective or Central projection

AXONOMETRIC PROJECTION

In axonometric projection the object, a cube for example, is placed such that its faces are inclined to the plane of projection, so that its three principal faces may.

TYPES OF AXONOMETRIC PROJECTION

The feature which distinguishes axonometric projection from other projections, is the inclined position of the object with respect to the plane of the projection

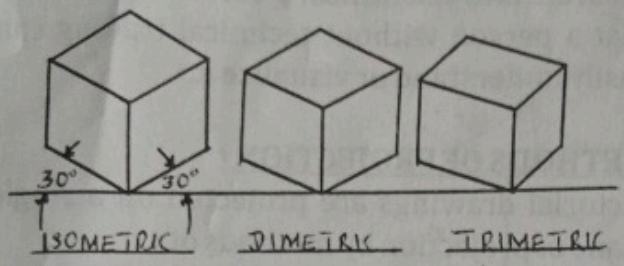
Axonometric projection is classified as:

i. Isometric projection
ii. Diametric projection, and
iii. Trimetric projection

In isometric projection, the three axes form equal angles of 120° to the plane of projection, and only one scale is needed for measurements along each of the three axes. This is the easiest type of axonometric drawing to execute.

In diametric projection, only two of the three angles are equal, and two special foreshortened scales are required to measure distances along their respective views.

Trimetric projection requires three different foreshortened scales, as all three angles between the three axes are different.

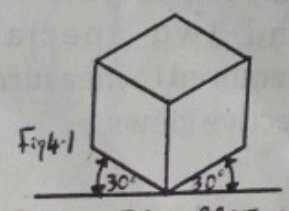


Because of the complexity of constructing diametric and trimetric drawings, in general, only the isometric type of the axonometric projection is used in practice

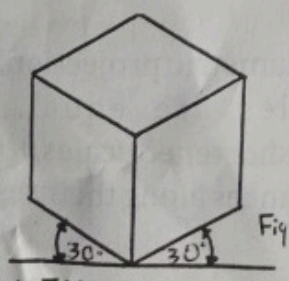
ISOMETRIC DRAWING (ISOMETRIC VIEW)/ISOMETRIC PROJECTION

The lines in isometric projection do not show the true lengths of the object edges, but are foreshortened by a definite amount.

If the foreshortening of the isometric lines in an isometric projection is disregarded and instead, the true lengths are marked, the view obtained (fig 4.11) will be exactly of the same shape but larger in proportion (about 22.5%) than that obtained by the use of the isometric scale (fig 4.1). To avoid confusion, the view drawn with the true scale is called ***isometric drawing or isometric view,*** while that drawn with the use of isometric scale is called ***isometric projection.***



ISOMETRIC PROJECTION

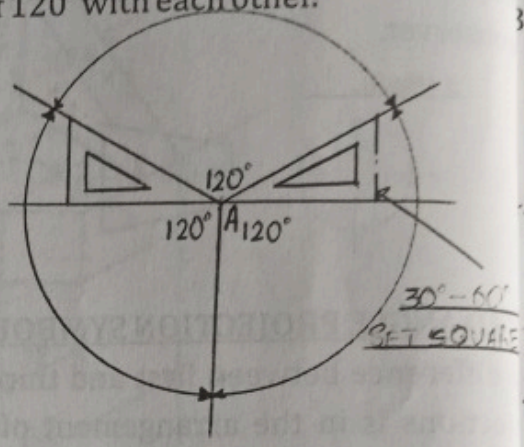


ISOMETRIC DRAWING

RECTANGULAR CONSTRUCTION

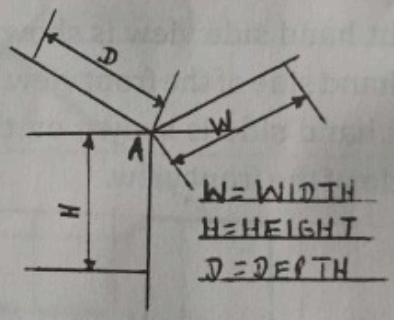
STEPS IN MAKING AN ISOMETRIC VIEW OBJECT OF RECTANGULAR CONSTRUCTION

1. The axes are first drawn at an drawn at angle of 120° with each other.



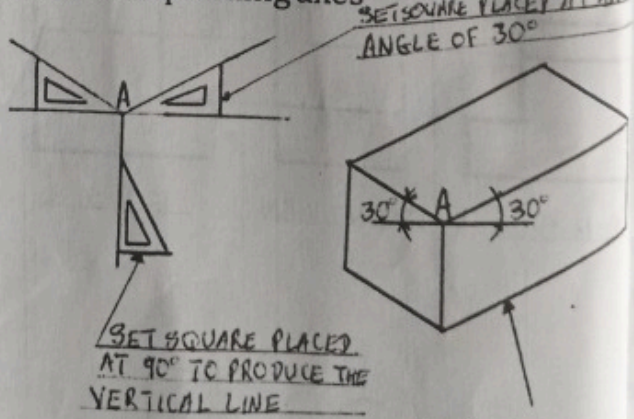
STAGE ONE

2. The measurements are made equal si along the axes, and



STAGE TWO

3. The remaining lines drawn parallel their corresponding axes

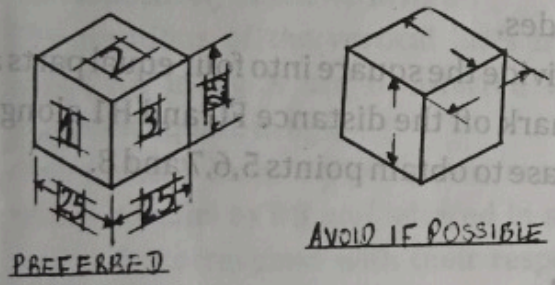


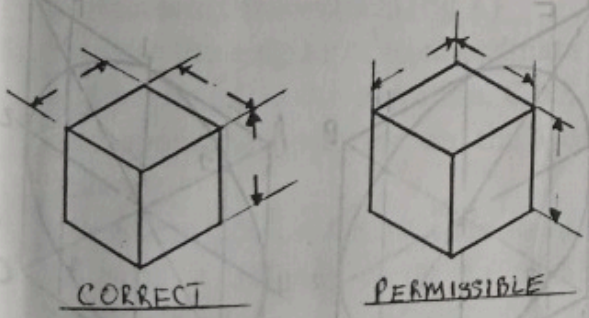
STAGE THREE

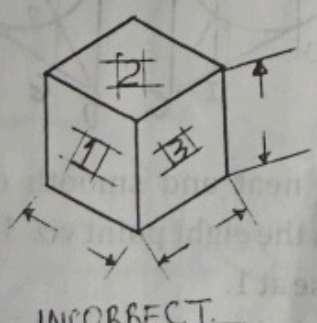
ISOMETRIC VIE

ISOMETRIC DIMENSIONING

1. All extension and dimension lines must be isometric lines, lying in isometric planes
2. If possible, apply the dimensions to visible surfaces.
3. Notes may be lettered either an isometric guide lines or as on ordinary drawing. Only vertical type of lettering should be used.
4. Very common error in dimensioning non isometric line and also the correct method of dimensioning it, are shown in the figures below.
5. Dimension numerals should appear to be in plane of the surface whose dimensions these indicate.







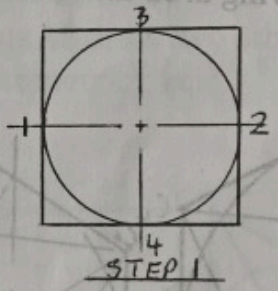
ISOMETRIC DRAWING OF CIRCLES

A circle, which appears, on any of the three regular faces of a component drawn isometrically has the shape of an ellipse. Isometric circles can be drawn using any of the following four methods.

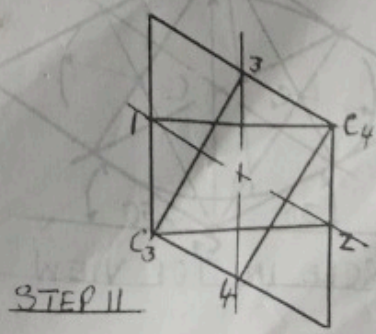
1. Four centre method.
2. Diagonal method or method of points.
3. Ordinate method.
4. American method.

FOUR CENTRE METHOD

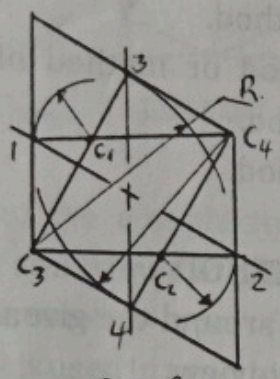
1. Draw a square around the given circle in the orthographic view.
2. Then mark the points of intersection of the two centre lines with the circle as 1,2,3, and 4, as in step (I).



3. Then draw the isometric view of this square which is a rhombus whose sides are equal to the diameter of the circle, as in step (ii).
4. Then erect perpendicular bisectors to each side using 30^0 – 60^0 triangle. The perpendiculars will intersect the opposite corners C_3 and C_4 of the rhombus.

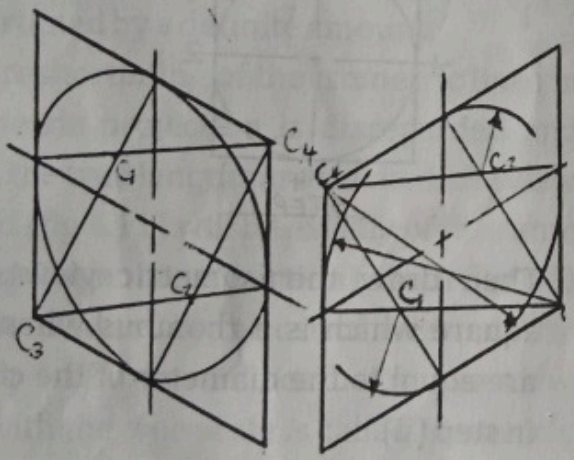


5. Other two points of intersection are C_1 and C_2 as shown in step (iii), which lie on the long diagonal.
6. The mid-points of the sides of the rhombus are points of tangency for the four area.

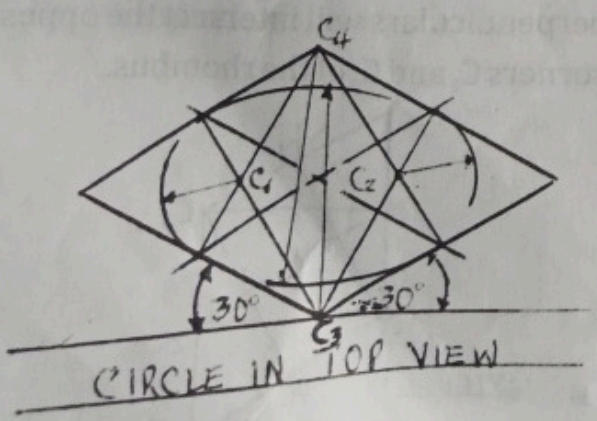


STEP III

7. The construction of the four centre ellipse is completed using C_1, C_2, C_3 and C_4 as centre for drawing area that make up the ellipse.



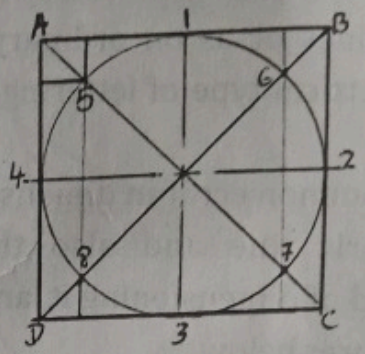
CIRCLE IN LEFT AND RIGHT SIDE VIEW



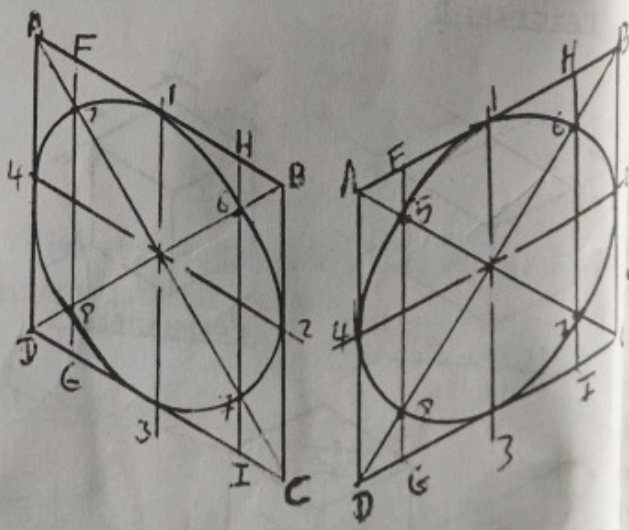
CIRCLE IN TOP VIEW

DIAGONAL METHOD OF POINTS

1. Enclose the circle in a square, touching in points 1, 2, 3 and 4.
2. Draw the diagonals of the square cutting the circle in points 5, 6, 7 and 8.



3. Draw the isometric view of the square and on it mark the mid-points 1,2,3 and 4 of sides.
4. Divide the square into four equal parts and mark off the distance FG and H1 along the base to obtain points 5,6,7 and 8.



5. Draw a neat and smooth circle passing through the eight point viz 1,6 2, 7,3, 8, and close at 1.

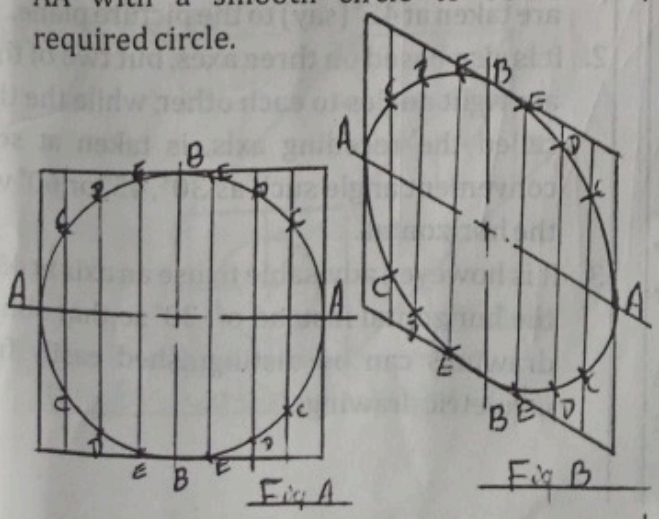
The circle is the required isometric view (circle). It is an ellipse.

THE ORDINATE METHOD

This method is the most accurate of all the methods.

STEPS

1. Enclose the required circle in a square as before
2. Draw the horizontal and vertical diameters AA and BB
3. Divide the horizontal diameter AA into a suitable number of parts (the spacing need not be equal). For greater accuracy, the end divisions should be spaced closely as shown in fig A
4. Draw vertical lines parallel to BB through the division points an AA.
5. Draw a square of equal size isometrically and divide it into four equal parts by lines AA and BB respectively as shown in fig B
6. The positions of the vertical lines from O along AA in fig A are transferred to the isometric square in fig B
7. The vertical lines or ordinates are then drawn parallel to BB and lettered in such a way as to correspond with their respective ordinates in the elevation (fig. A)
8. Transfer the lengths of each ordinate above and below AA in the elevation, C,D,E etc, to corresponding positions on the isometric square
9. Join points C,D,E, etc both above and below AA with a smooth circle to obtain the required circle.

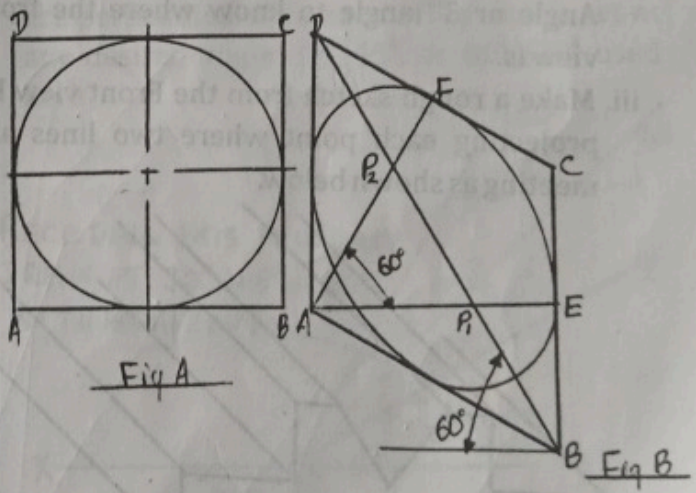


THE AMERICAN METHOD

The American method is usually the easiest of the methods because the ellipse so formed can be drawn with the composes

STEPS

1. Enclose the required circle in a square ABCD as in fig A
2. Draw square of the same size isomatrically as in fig B
3. Side BC is bisected at E by means of a horizontal line drawn from A and the side CD is bisected at F by a line drawn at 60° from A.
4. Draw the diagonal BD at an angle 60° to the horizontal to intersect AE and AF at P_1 and P_2 respectively.
5. With centre P_1 and P_2 and radii P_1E and P_2 F draw area and with centre A and C and radius AE draw two other arcs to complete the isometric circle.



NOTE

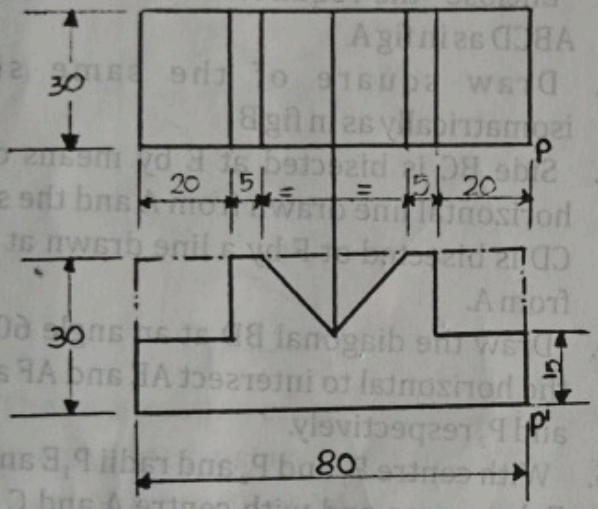
The American method is not recommended in any situation where accuracy is essential.

CONVERSION OF ORTHOGRAPHIC VIEWS INTO PICTORIAL VIEWS (COUPLING)

When the orthographic views have been given. The Front views on the side view can be used to start the coupling process

Example

Lets' look at the object given in the figure below.

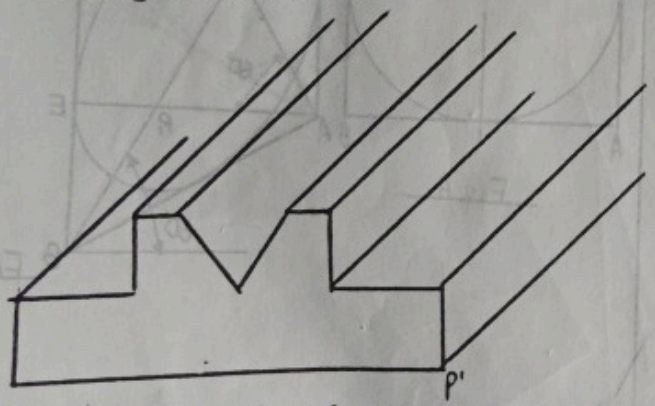


PROCEDURES TO FOLLOW WHEN COUPLING

i. Look for the lowest point (i.e P in this case) if not given locate your lowest point.

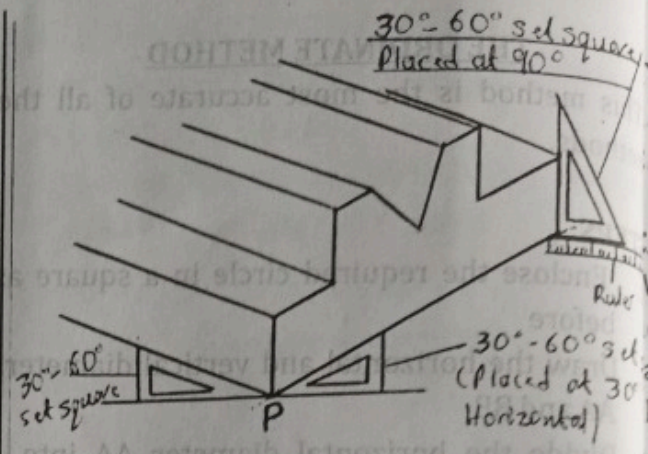
ii. Identify the system of projection to if it is 1st Angle or 3rd angle to know where the from view is.

iii. Make a rough sketch from the Front view by projecting each point where two lines are meeting as shown below.

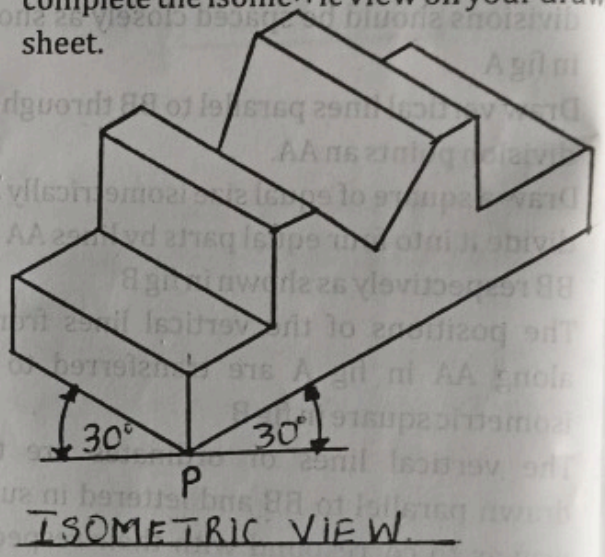


iv. Then make another sketch of the front view isometrically using your $30^0 - 60^0$ set square observing the lowest point.

(the lowest point p and p' means the point where the isometric view will be projected from) see the diagram.



v. now following the dimensions giv complete the isometric view on your draw sheet.



ISOMETRIC VIEW

OBLIQUE PROJECTION

1. In this type of pictorial projection, the vie produced by using parallel projectors make some angle other than 90° with plane of projection. One face is place par to the picture plane and the projection are taken at 45° (say) to the picture plane.
2. It is also based on three axes, but two of t are right angles to each other, while the t called the receding axis, is taken at s convenient angle such as 30°, 45° or 60° the horizontal.
3. It is however, advisable to use an axis at 4 the horizontal instead of 30° so that obl drawings can be distinguished easily f isometric drawing.

TYPES OF OBLIQUE PROJECTION

1. Cavalier Projection
2. Cabinet Projection

CAVALIER PROJECTION

When the oblique axis is drawn at 45° to the horizontal and the receding edges drawn to the same scale as that used for the measurements along the horizontal and vertical as shown in fig. A, we obtain a particular type of oblique projection called cavalier projection.

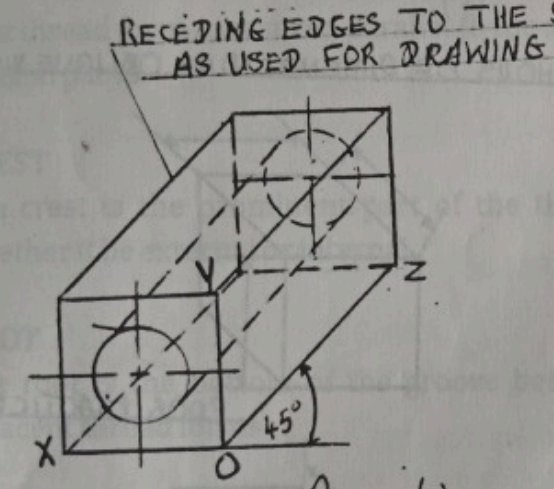


Fig A Cavalier Projection

CABINET PROJECTION

If all the receding edges are drawn to a scale one half the scale used for measurements along the horizontal and vertical axis, the drawing is called cabinet projection! as shown in fig B.

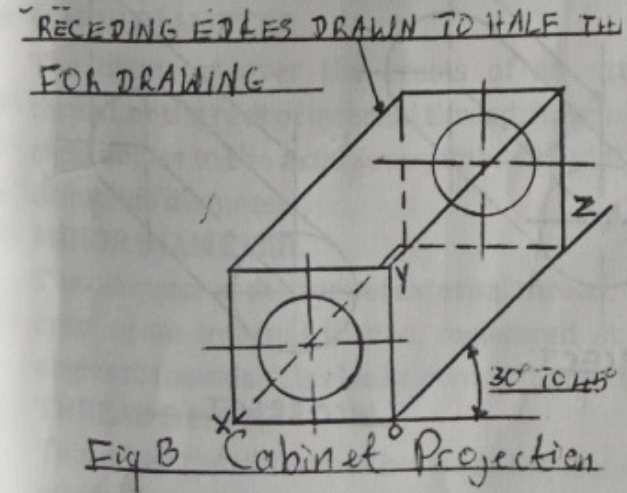
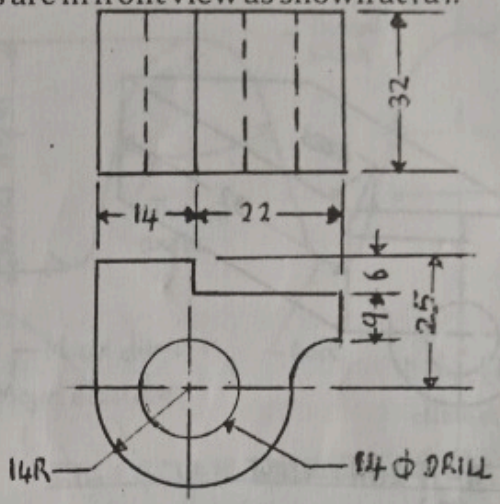


Fig B Cabinet Projection

MAKING AN OBLIQUE DRAWING

In general, the procedure for constructing an oblique drawing is the same as used for making an isometric drawing.

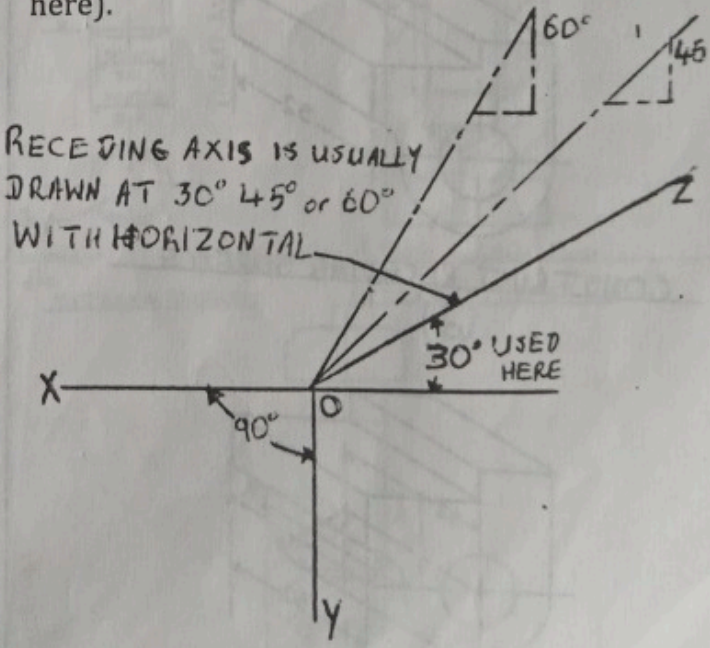
Fig.5.1 illustrate the different steps of construction for an oblique drawing using the box-method. The orthographic views of the object reveal that most of irregular lines and circles are in front view as shown at (a).



GIVEN
(a)

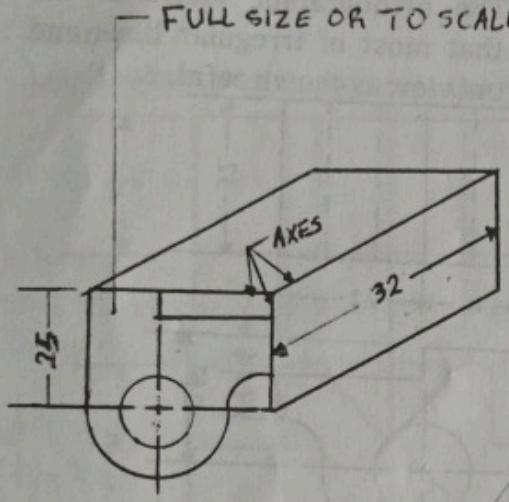
STEPS

1. The three axes that establish the perpendicular edges are drawn through 0, representing the Front corner, as shown at (b). Here OX and OY are perpendicular to each other and is set at any desired angle 30°, 45°, or 60° (30° used here).



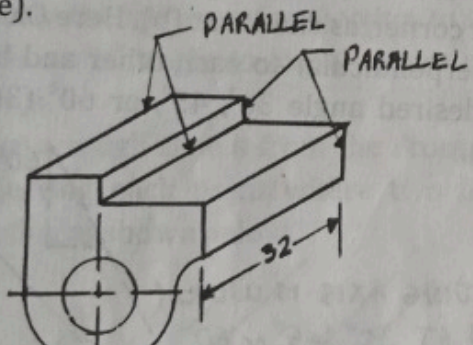
CONSTRUCT THE AXES.
(b)

2. On these three ones the boxes to enclose different component parts of the object are constructed. After the width, height, and depth have been set off, the front face may then be laid out in its true shape and size as shown at (C).

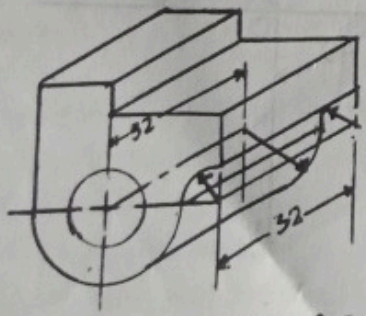


DRAW THE FRONT VIEW
(C)

3. The view can be completed in thin lines by drawing lines parallel to the receding axis through all the established corners, as at (d) and (e).

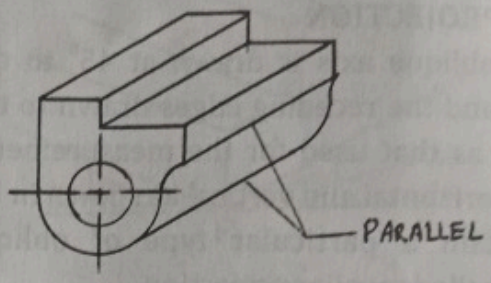


CONSTRUCT RECEDING SURFACE
(d)



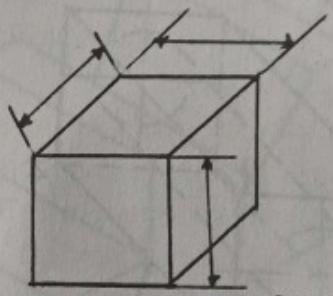
DRAW ARCS ON THE REAR FACE
(e)

4. Finally the required lines are brightened to finish the drawing, as at (f).

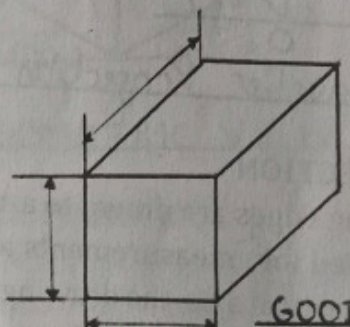


FINISH THE DRAWING
(f).

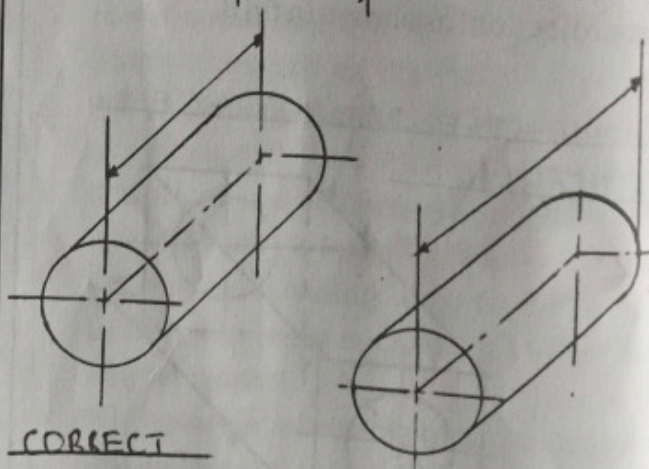
METHODS OF DIMENSIONING OBLIQUE VIEW



POOR PRACTICE



GOOD PRACTICE



CORRECT

INCORRECT

SCREW THREAD, SCREW FASTENERS AND KEYS

SCREW THREADS

A SCREW thread is a helical groove which is cut, rolled or sometimes cast on a cylinder or in a cylindrical hole. These are parallel threads on the cylinder, or screw, being external, and that in the hole or nut, being internal.

SCREW THREAD TERMS PITCH

The pitch of a thread is a distance from a point on one tread form to the corresponding point of the next thread form, measured parallel to the axis in an axial plane.

CREST

The crest is the prominent part of the thread, whether it be external or internal.

ROOT

The root is the bottom of the groove between adjacent thread forms

FLANKS

The flanks of the thread are the straight sides which connect the crest and the root

THREAD ANGLE

This is the angle between the flanks measured in an axial plan.

MAJOR DIAMETER

The diameter over the crests of an external thread, or the root of internal thread, measured at right angles to the axis. Sometimes called the full of outside diameter.

MINOR DIAMETER

The diameter at the root of external thread, or the crest of an internal thread, measured at right angles to the axis. It is also known as diameter.

THREAD DEPTH

This is half the difference between the major and minor diameters.

EFFECTIVE DIAMETER

The diameter of a cylinder co-axial with the thread, which cuts the flanks of a thread form in two points such that the distance between them is half the pitch. Also called pitch diameter.

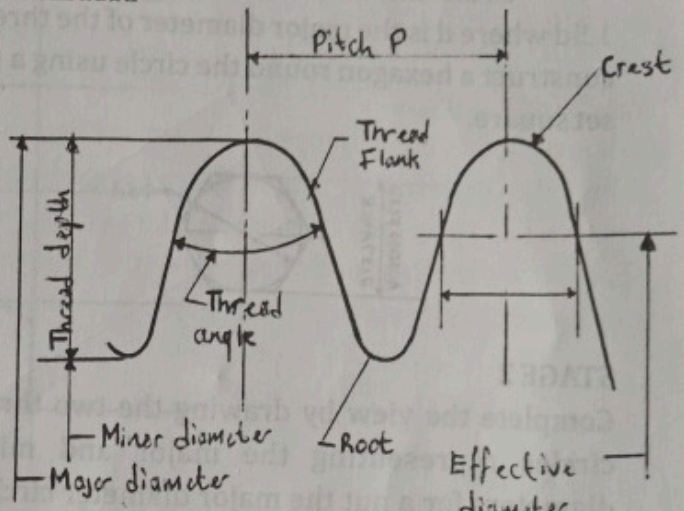
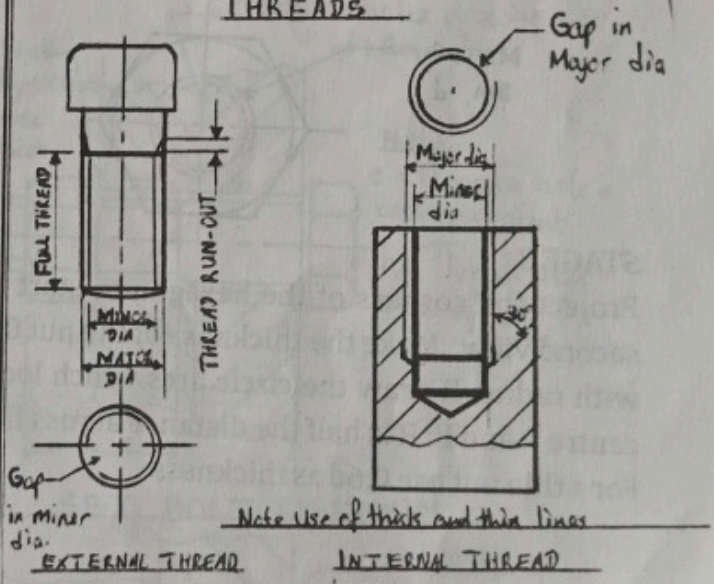
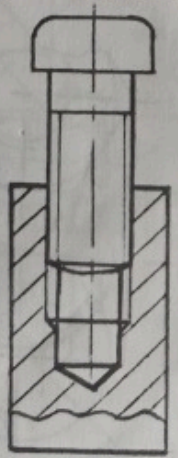


FIG.1 SCREW THREAD TERMS

CONVENTIONAL REPRESENTATION OF SCREW THREADS



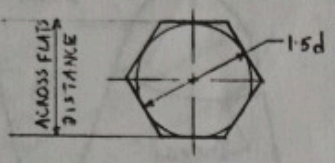


THREAD ASSEMBLY

SCREW FASTENERS
DRAWING HEXAGON NUTS.

STAGE 1

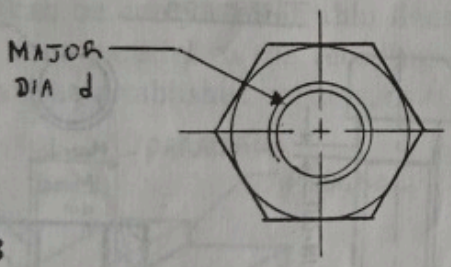
Draw the chamfer circle with diameter 1.5d where d is the major diameter of the thread construct a hexagon round the circle using a 60° set square.



STAGE 2

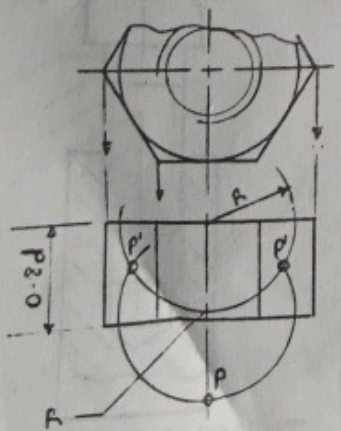
Complete the view by drawing the two thread circles representing the major and minor diameters for a nut the major diameter circle is shown with a break.

The minor diameter circle is broken for a bolt.



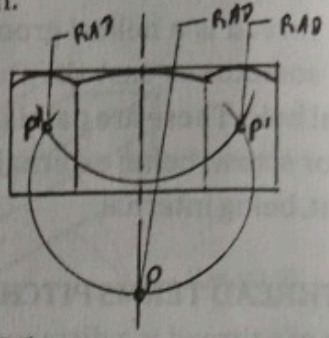
STAGE 3

Project the corners of the hexagon to start the second view. Make the thickness of the nut 0.8d with radius R draw the circle arcs which locate centre P and P: R is half the distance across flats. For a thin nut use 0.6d as thickness



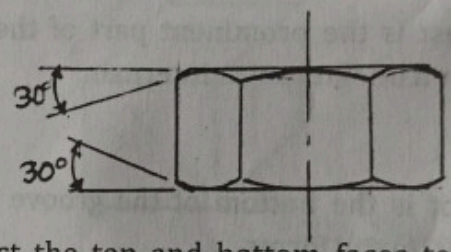
STAGE 4

Draw in the chamfer curves using the radii centre shown.



STAGE 5

Draw the chamfer curves on the second face 30° chamfers tangential to radii on outside f and line in the view. NOTE that the 30° cham are only apparent on large nuts.

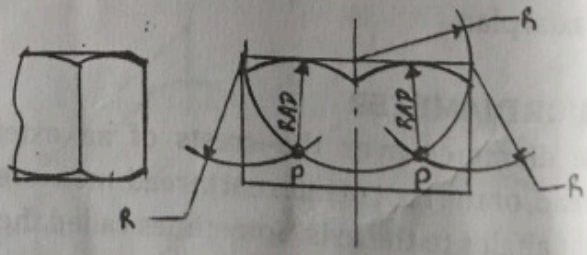


Project the top and bottom faces to start third view.

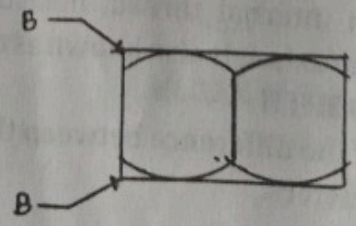
Make the width of this view equal to the ac flats distance.

With radius R draw the circle arcs which lo centre P.

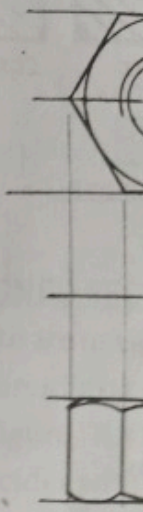
Draw chamfer curves as shown.



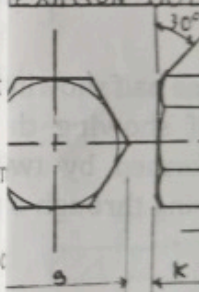
Draw the chamfer curves on the second line in the view noting the sharp corners of



STAGE 8



EXAGON BOL



WASHER

Drawing Propo

=1·5d
=0·7d
P = 1·5d
= 1mm

hread lengths

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d + 12mm from
d + 25mm over

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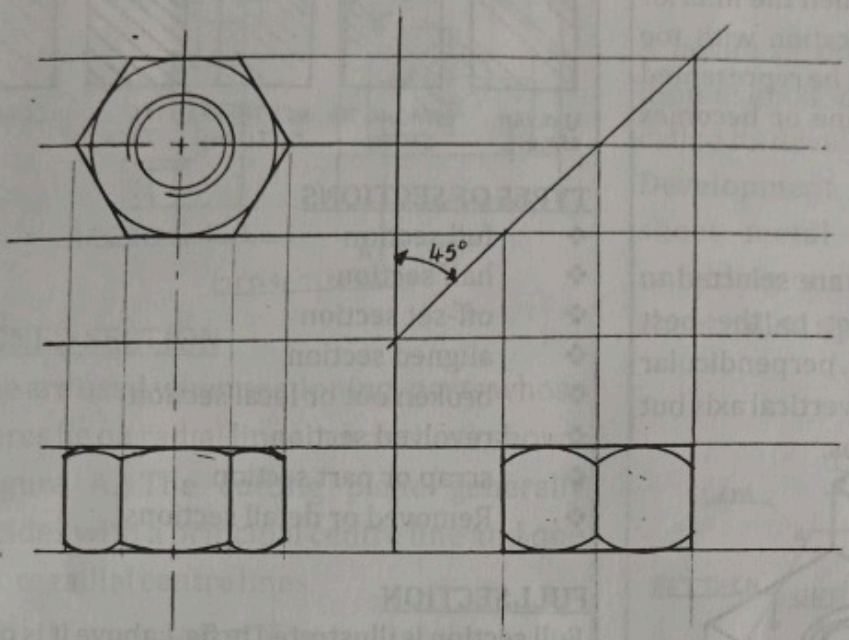
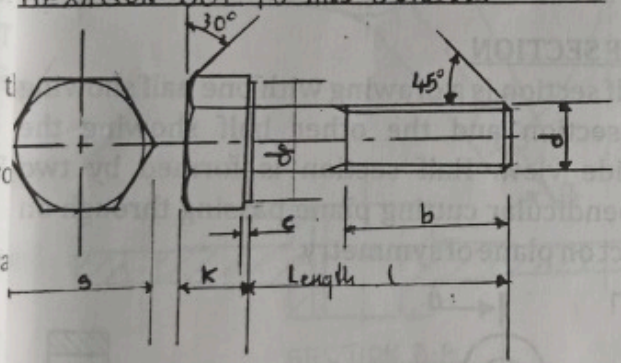
STAGE 8



COMPLETED VIEWS

HEXAGON BOLTS AND SCREWS



WASHER FACED HEAD

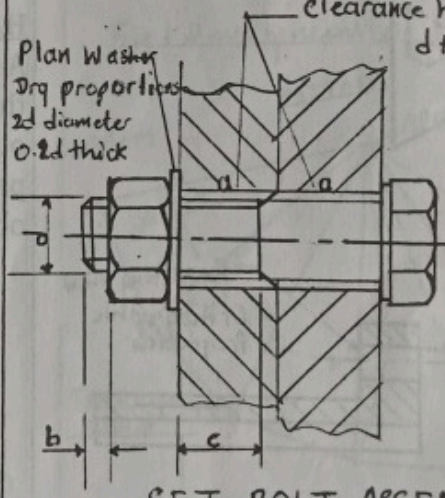
Drawing Proportions

$s = 1.5d$
$k = 0.7d$
$d_\rho = 1.5d$
$c = 1mm$

Thread lengths b

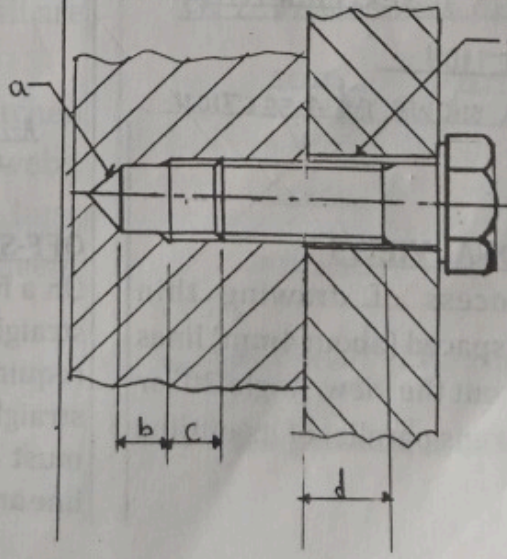
2d + 6mm for lengths l up to 125mm
2d + 12mm from over 125 mm to 200mm
2d + 25mm over 200mm

NUT AND BOLT ASSEMBLY



Note
a. clearance hole in each component
b,c Thread each side of nut.

SET BOLT ASSEMBLY



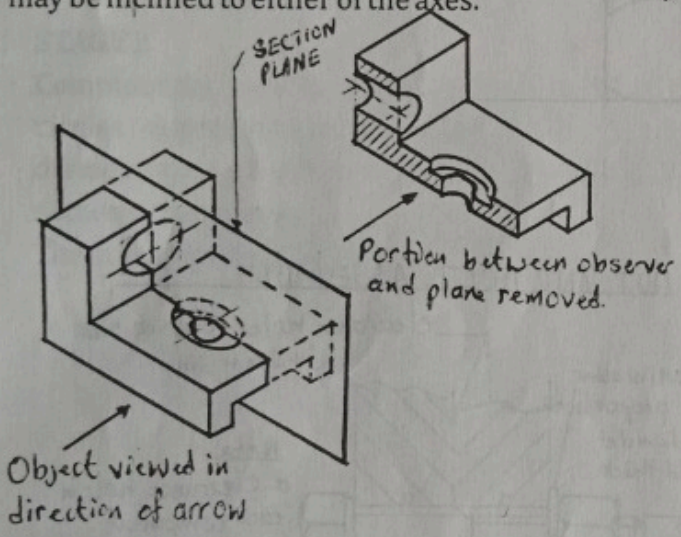
Note
a = 120° drill point
b = Unthreaded bottom of tapping hole
c = Thread in tapping hole below bolt.
d = Bolt thread above joint line
e = Clearance hole in outer detail.

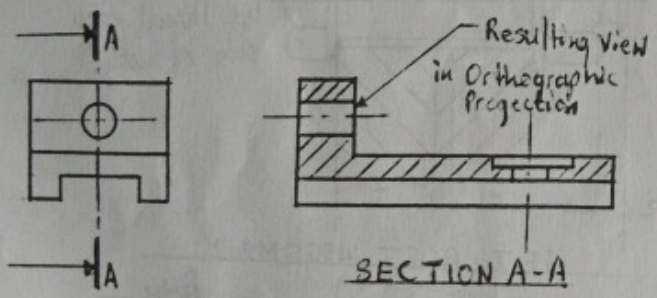
SECTIONAL VIEWS

Sectional views are necessary when the interior detail of an object is so complication with too numerous dash line that it cannot be represented satisfactorily by hidden detail line or becomes too difficult to interpret.

SECTION PLANES

Section planes or cutting planes are selected to show the interior of the object to the best advantage. They are generally perpendicular planes to either the horizontal or vertical axis but may be inclined to either of the axes.





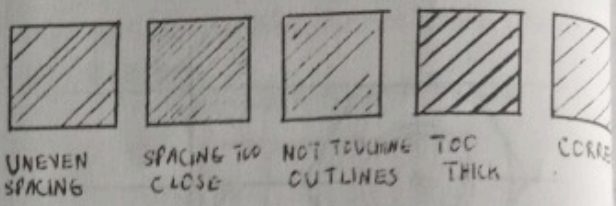
FULL SECTION

FIG 1 INTERIOR SHOWN BY A SECTION

HATCHING OF SECTIONAL VIEWS

Hatching is the process of drawing thin continuous, uniformly spaced (about 4mm) lines inclined at 45° throughout the view. Angle 30° or 60° may be used if 45° runs parallel of its outline or axis.

FAULTS IN SECTION LINING



TYPES OF SECTIONS

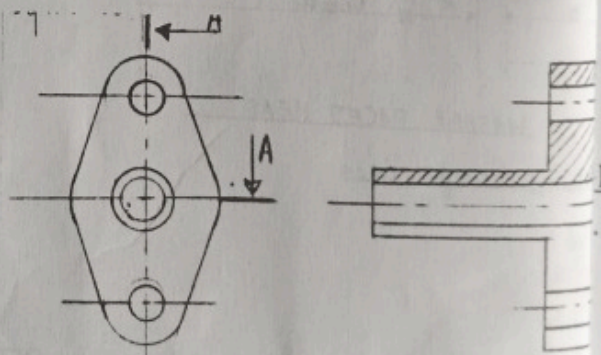
- full section
- half section
- off-set section
- aligned section
- broken out or local section
- revolved section
- scrap or part section
- Removed or detail sections

FULL SECTION

Full section is illustrated in fig 1 above it is obt when an imaginary cutting plane pas completely through the object.

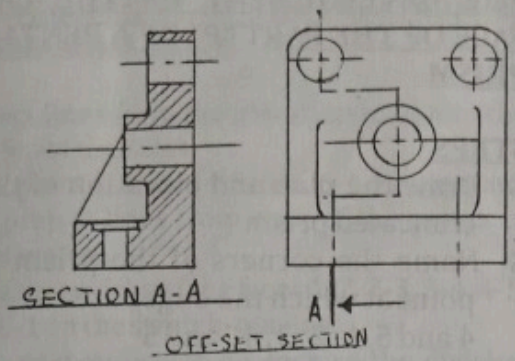
HALF SECTION

A half section is a drawing with one half showi the section and the other half showing t outside view. Half section is formed by t perpendicular cutting plane passing through object on plane of symmetry.



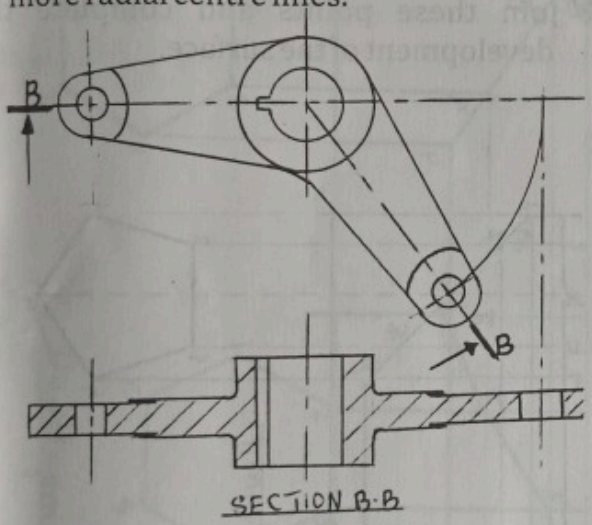
OFF-SET SECTION

On a full section the cutting plane need not p straight through an object, but may be off-se required to include features which are not i straight line. The position of the cutting pl must be shown in a view where it appears a line and the resulting view should carry a title



ALIGNED SECTION

These are used when sectioning parts whose features lie on radial line such as those shown in figure A. The cutting plane generally coincides with a principal centre line and one or more radial centre lines.



GENERAL REMARK

1. In sectioning a machined part with rib, section line from the ribs or thin wall are omitted i.e the ribs are not hatched.
2. Other components which are not hatched are shafts, bolts, screws, pin, keys, webs, or stiffners, gear teeth, washer, lugs, pulleys rivets and rods, hand wheels, spokes etc.

DEVELOPMENT OF SURFACES

A layout of the complete surface of a three dimensional object on a plane surface is called its development or pattern.

Development is a term frequently used in sheet metal work where it means the unfolding or unrolling of a detail into a flat sheet called a pattern.

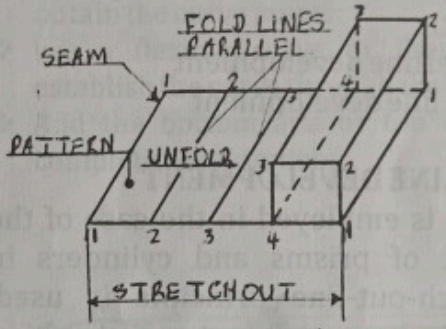


Fig-1 Development of Prism

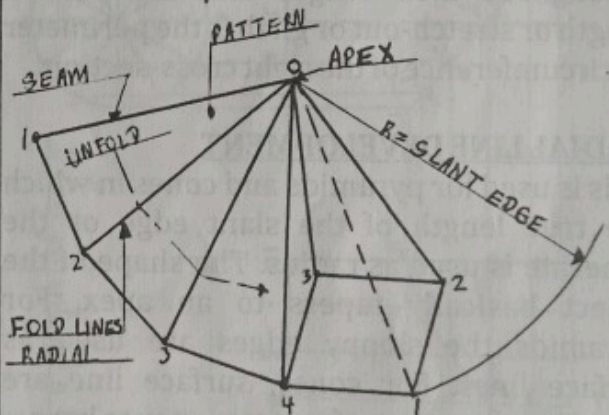


Fig-2 Development of Pyramid

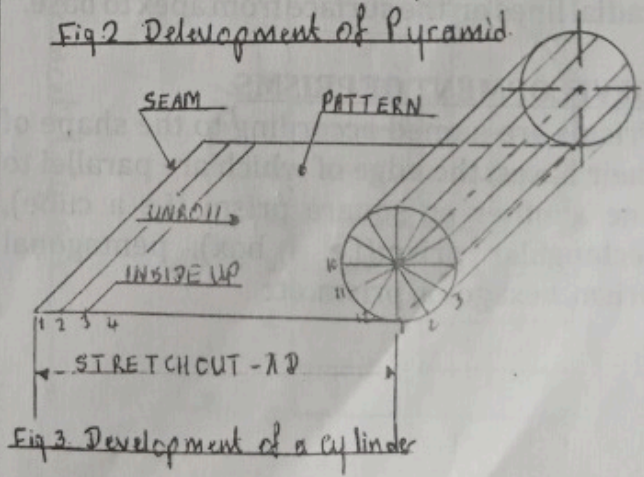


Fig-3 Development of a Cylinder

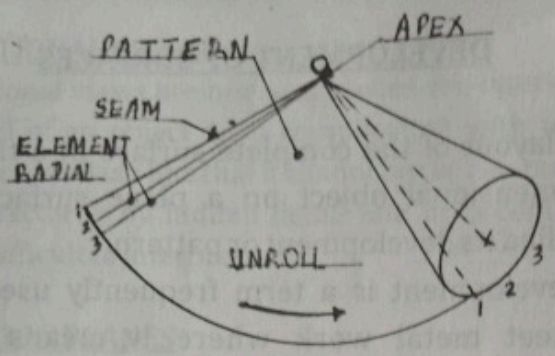


Fig 4 Development of a Cone

METHODS OF PATTERN DEVELOPMENT

There are two method of pattern development;

1. Parallel line development
2. Radial line development

PARALLEL LINE DEVELOPMENT

This method is employed in the case of the development of prisms and cylinders in which stretch-out-line principle is used. These objects have constant cross-section throughout their length and the pattern length or stretch-out or girth is the perimeter or circumference of the right cross-section.

RADIAL LINE DEVELOPMENT

This is used for pyramids and cones in which the true length of the slant edge or the generate is used as radius. The shape of the object basically tapers to an apex. For pyramids the sloppy edges are used as surface lines. For cones, surface line are radial lines on the surface from apex to base.

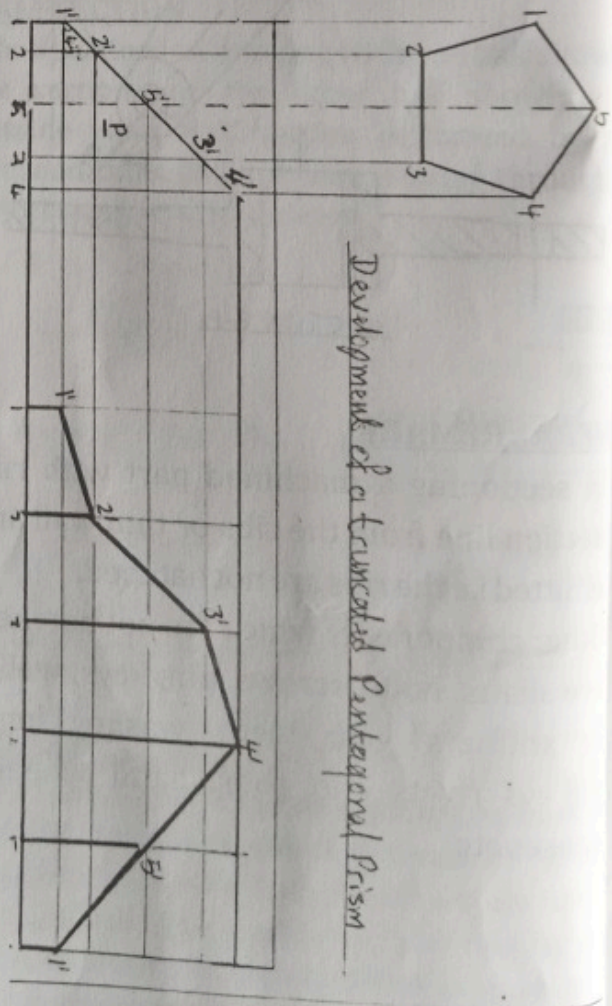
DEVELOPMENT OF PRISMS

Prisms are named according to the shape of their bases, the edge of which are parallel to one another eg square prism (i.e a cube), rectangular prism(i.e a box), pentagonal prism, hexagonal prism. etc

THE DEVELOPMENT OF THE LATER FACE OF THE PART "P" OF A PENTAGON PRISM

STEPS

- Draw the plan and elevation of the gi truncated prism
- Name the corners of the prism and point at which the edges are cut eg 1, 2, 4 and 5, 1', 2', 3', 4', and 5'
- Draw the development assuming prism to be whole by projecting li from the elevation and completing rectangles
- Draw horizontal line through point 1 etc to cut the lines from corresponding edges in the developm
- Join these points and complete development of the surface.

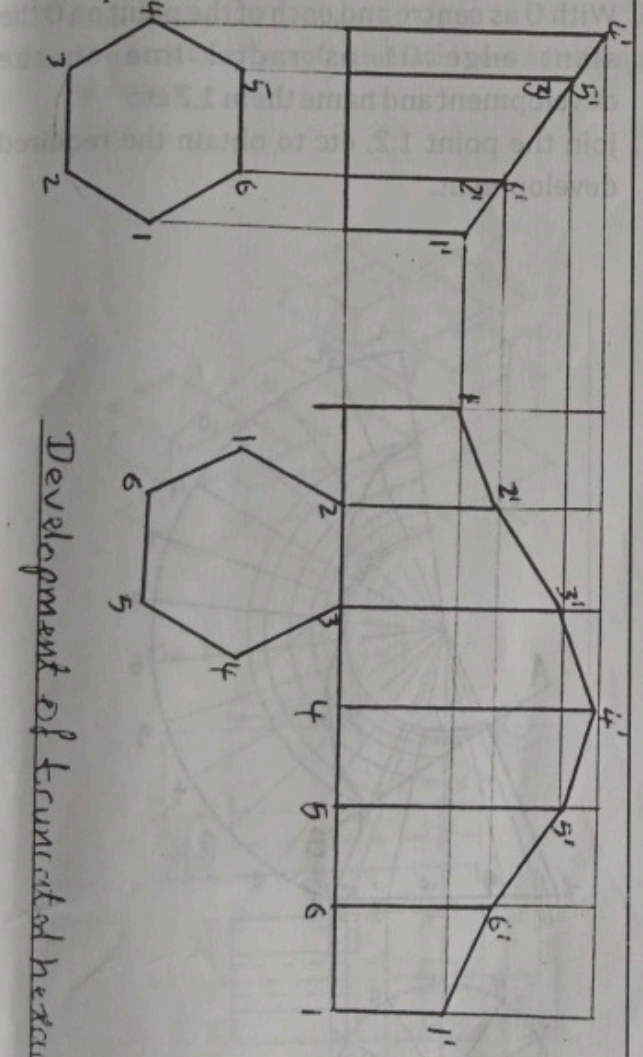


Development of a truncated Pentagonal Prism

THE DEVELOPMENT OF THE FRUSTRUM OF THE HEXAGONAL PRISM

STEPS

- Project lines from the elevation to obtain the heights of the sides
- Mark point 1-2, 2-3, 4-5, 5-6, 6-1 on the plane and project lines from each of the points to the elevation.
- Set of the widths of the faces 1-2, 2-3, 3-4, 4-5, 5-6, 6-1 on the stretch-out line.
- Erect perpendicular on each of the division and set off on each the length of the respective edge 1', 2',3', 4', 5', 6' and 1
- Join each of the heights with straight lines and the bottom to form the complete frustum of the prism.

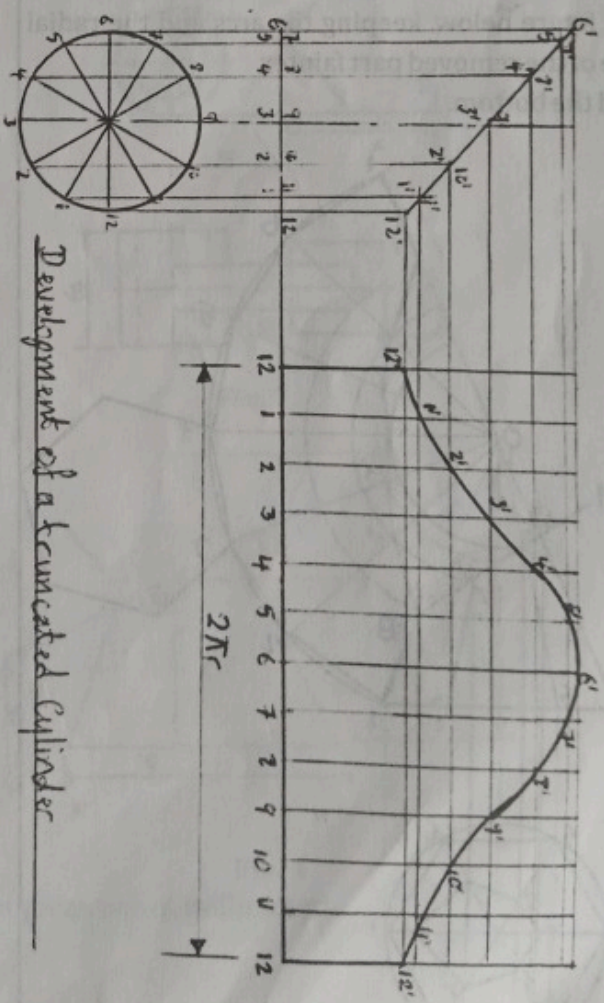


Development of truncated hexagonal Prism

THE DEVELOPMENT OF THE FRUSTRUM OF THE CYLINDER

STEPS

- Draw the elevation and plan.
- Divide the base circle into 12 equal parts.
- Divide the circumference of the plan into the same number of equal parts 1-12 and project these points to the elevation to meet the cutting plane at 1', 2' etc.
- Project horizontal line from the point 1', 2' etc on the elevation to obtain the true heights of the curve onto the corresponding vertical line or generators on the development.
- Mark the point 1' – 12' on the vertical lines to obtain the curve points.
- use a flexible curve or French curve to establish the curve through the curve points
- Add the bottom and or top to obtain the complete development.

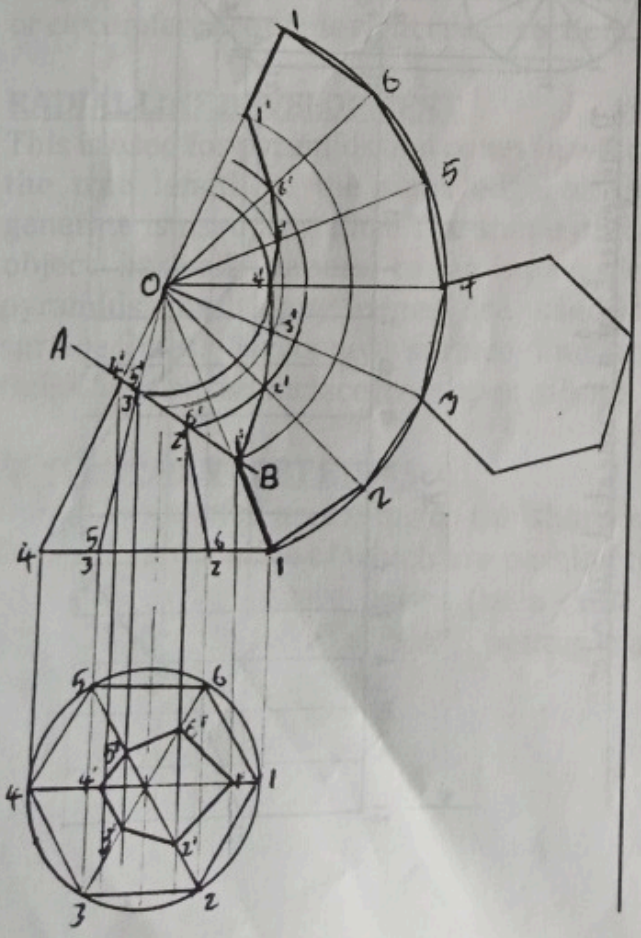


Development of a truncated Cylinder

THE DEVELOPMENT OF FRUSTRUM HEXAGONAL PYRAMID

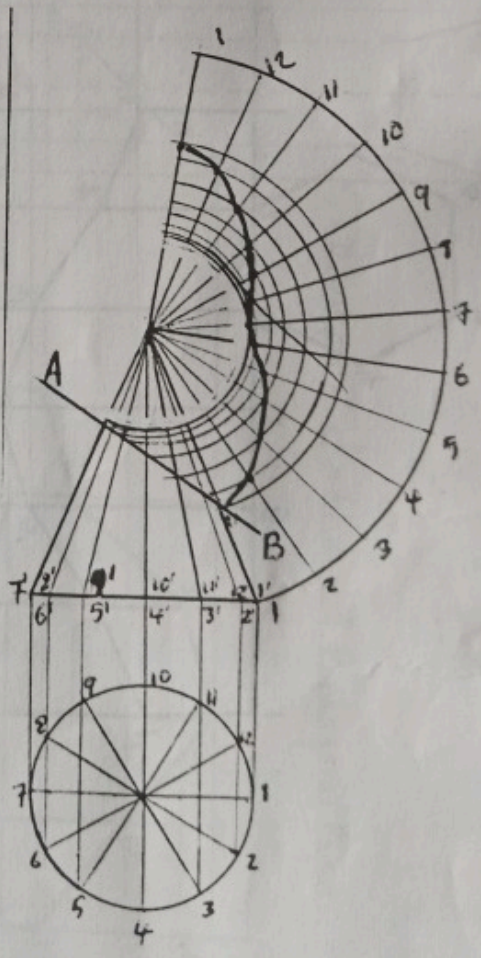
STEPS

- Draw the front elevation and the plan and number the base 1,2,3,4,5,6
- Draw the cutting plane AB meeting slant edges at 1,2,3,4,5 and 6.
- With apex o as centre and radius equal to the slant edge 0-1 draw an arc.
- Step off on the arc straight from 1, the length of the edge of the pyramid and number the point as 1,2,3,4,5,6,1. join these point to form the base chords
- From the points 1,2,3,4,5,6 on the cutting plan draw lines parallel to the base of the front view to meet slant edge 01
- From where these line touch 01 and with centre 0 draw concentric arcs cut the corresponding radial line 01, 02 etc at 1,2 etc.
- Join the points 1,2,3,etc to the base pointers to complete the required development as shown in the figure below. keeping the arcs and the radial line of the removed part fainter
- Add the bottom.



THE DEVELOPMENT OF FRUSTRUM OF CONE STEPS

1. Draw the elevation and plan
2. Divide the plan into 12 equal parts and proj these points to the base of the elevation.
3. Radiate line from O to the point on these b of the elevation, where the radiating line the cutting plan AB. project lines horizont to touch the slant edge O1.
4. With O as centre and radius equal to the leng of the slant edge O1, draw an arc equal to t circumference of the base circle.
5. Divide the arc into 12 equal part and join t division point to O as radial line.
6. With O as centre and each of the point on O t slant edge O1 as radial line on t development and name them 1,2 etc
7. Join the point 1,2, etc to obtain the require development.



FEDERAL UNIVERSITY OF TECHNOLOGY, OWERIU
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF AGRICULTURAL ENGINEERING
2010/2011 RAIN SEMESTER EXAMINATION
COURSE TITTLE: ENGINEERING DRAWING 11: COURSE CODE:ENG 104
TIME: 3 HOURS DATE: 22109/2011

INSTRUCTIONS: (1). Answer question (1) and any other three. (ii) write your name (in full) and your registration number with ink (iii) submit the following assignments in your manual to your lecturers on /before 26/09/2011. Page 8 nos l & 2, page l4no l, pg22nol.

1. a. Draw the general convention of a 3 — step pulley, having diameters of 50 mm, 35 mm and 20 mm respectively, and width of 8 mm for each pulley.
   b. Using first angle orthographic projection, draw all the views of the object in fig. (1) viewed from direction T.
2. Make an oblique drawing of the views in fig (2)
3. Draw in third angle projection, the three views of a hexagonal nut having major diameter of 30mm and minor diameter of 26mm.
4. Draw section Y- Y as shown in fig (3)
5. The front elevation of a truncated cone cut along plane B-B, is shown in figure (4). Draw the development of the surface.

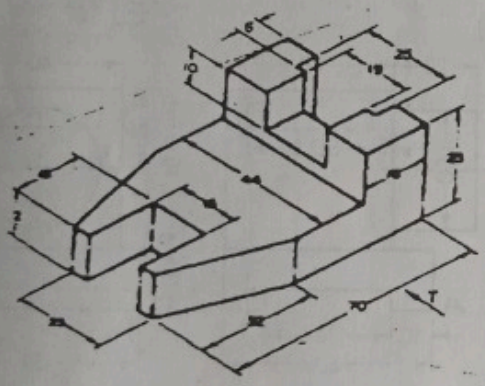


Fig. 1

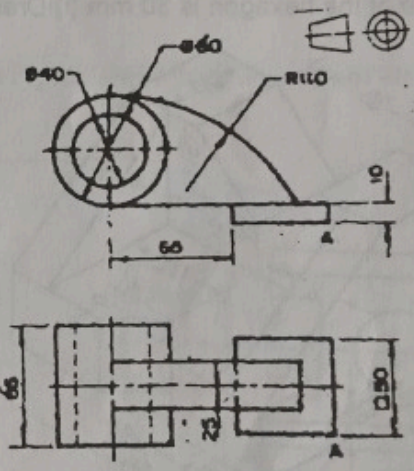


Fig. 2

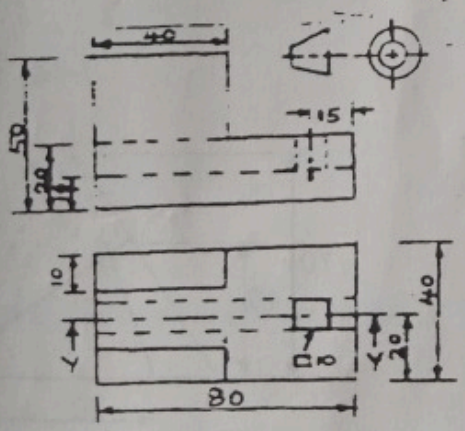


Fig. 3

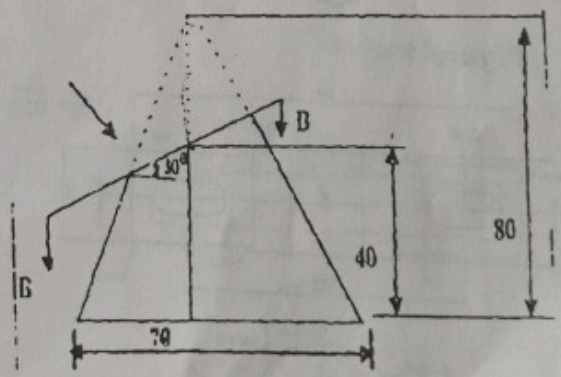


Fig. 4

Note: All other dimensions not given are in millimeters

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DEPARTMENT OF AGRICULTURAL ENGINEERING
2011/2012 RAIN SEMESTER EXAMINATION

COURSE: ENG 104 – ENGINEERING DRAWING II. TIME: 3 HOURS. DATE: 20/09/2012

INSTRUCTIONS: (i) Answer Question (1) and any other three questions (ii) Write your names (in full) and registration no with ink (iii) Submit the following assignments on your manual to your respective lecturers, on/before 24/09/2012. [pg 4 nos 3 & 4; pg 8 nos 2, 3 &4; pg 17 no 1]

1. Using First Angle orthographic projection, draw the front elevation, plan and left hand side view of the object in Figure 1, viewed from direction X.
2. Make isometric drawing of the views in Fig. 2, such that point A is the lowest point on the drawing.
3. a. Draw the conventional representation of these holes: (i) 18 Drill - 30 C/Bore, 12 Deep (ii) 14 Drill 82^0 CSK, 29 DIA
   b. Draw in Third Angle orthographic projection, the three views of a hexagonal nut,having major diameter of 30 mm and minor diameter of 26 mm.
4. Draw the given plan view of the bearing and replace the given front elevation by a Sectional front elevation A - A (Figure 3)
5. Copy the front elevation of the truncated hexagonal-based pyramid, shown in Figure 4.The length of side of the hexagon is 30 mm (i) Draw the plan view; (ii) Draw the development of the surface.

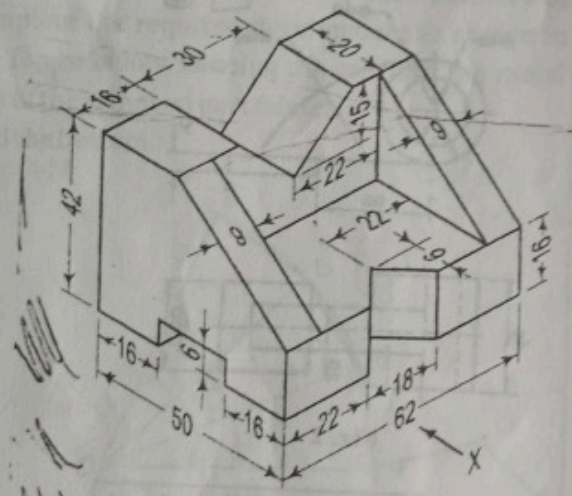

Figure 1

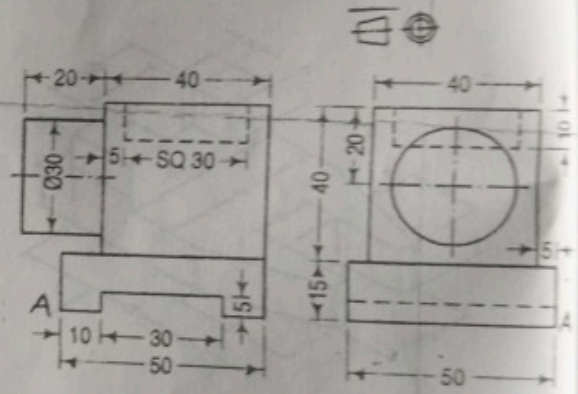

Figure 2

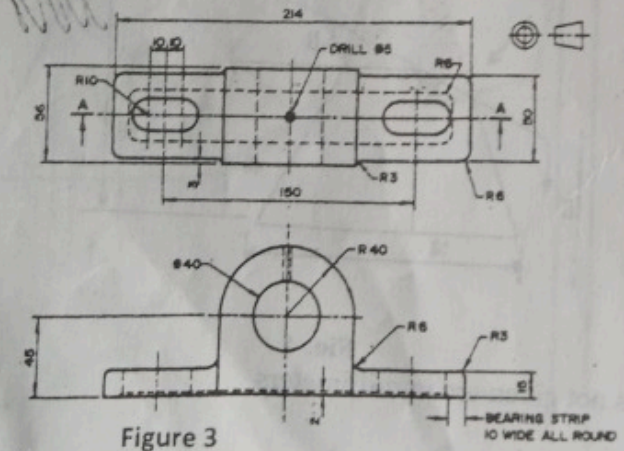

Figure 3

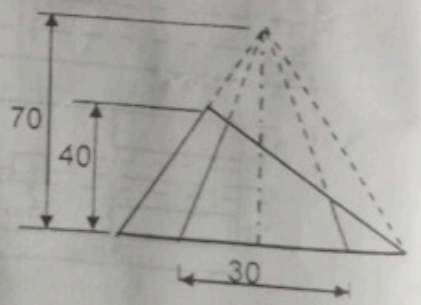

Figure 4

(All Dimensions are in millimeters)

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DEPARTMENT OF AGRICULTURAL ENGINEERING
2012/2013 RAIN SEMESTER EXAMINATIONS

COURSE: ENG 104 - ENGINEERING DRAWING II. TIME: 3 HOURS. DATE: 23/01/2014

INSTRUCTIONS: (i) Answer question 1 and any other three questions (ii) Write your names (in full) and registration number with ink (iii) Submit the following assignments in your manual to your respective lecturers on/before 28/01/2014 [pg 4 nos 3 & 4 ; pg 8 nos 2, 3 & 4; pg 17 no 1]

1 a. Draw the revolution convention of the steering wheel of an automobile, using your own dimensions.
b. Using third angle orthographic projection, draw the front elevation, plan and the two side views of the object in Figure 1, viewed from direction T.

2 Make isometric drawing of the views in Figure 2, such that point A is the lowest point on the drawing.

3. Draw the given section Y – Y as shown in Figure 2.

4 a. Draw the conventional representation of a five step pulley, having diameters of 25 mm, 32 mm, 40 mm, 50 mm and 60 mm respectively.
b. Draw in Third angle Orthographic projection, the three views of a hexagonal nut, having major diameter of 30 mm and minor diameter of 26 mm.

5. Copy the front elevation of the truncated cylinder shown in Figure 3 with base diameter of 40 mm. Draw (i) the plan view; (ii) the development of the surface.

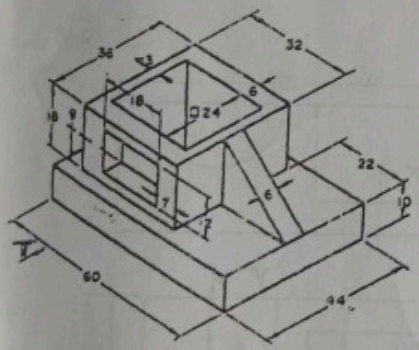

Figure 1

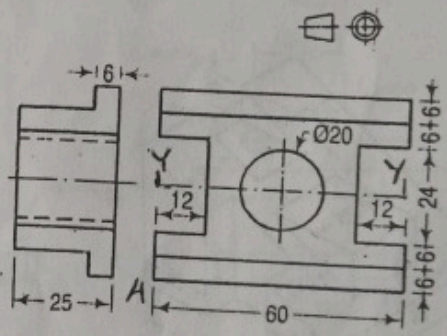

Figure 2

All Dimensions are in millimeters

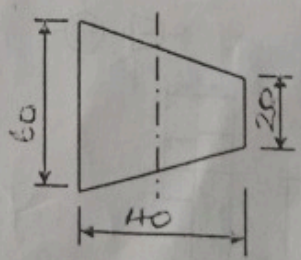

Figure 3

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2013/2014 RAIN SEMESTER EXAMINATIONS

COURSE: ENG 104 - ENGINEERING DRAWING 11. TIME: 3 HOURS. DATE: 02/10/2014

INSTRUCTIONS: (i) Answer question 1 and any other three questions (ii) Write your names (in full) and registration number with ink (iii) Submit the following assignments in your manual to your respective lecturers on/before 06/10/2014 [pg 4 nos 3 & 4 ; pg 8 nos 1&2; pg 10 no 1; pg 17 no 1]

1. Using third angle orthographic projection, draw the front elevation, plan and the two side views of the object in Figure 1, viewed from direction X.

2. Make isometric drawing of the views in Figure 2, such that point B is the lowest point on the drawing.

3 a. Draw the conventional representation of these holes: (i) 18 Drill-30 C/Bore. 12 Deep (ii) 14 Drill 82° CSK. 29 DIA.

b. Using third angle projection, draw three views of a hexagonal bolt with a washer faced end, having major and minor diameters of 32 and 26 mm respectively and a nominal length of 120 mm. Show the thread end chamfered.

4. Draw sections Y-Y and P-P as shown in Figure 2.

5. Make an oblique drawing of the views in Figure 3, such that point A is the lowest point on the drawing.

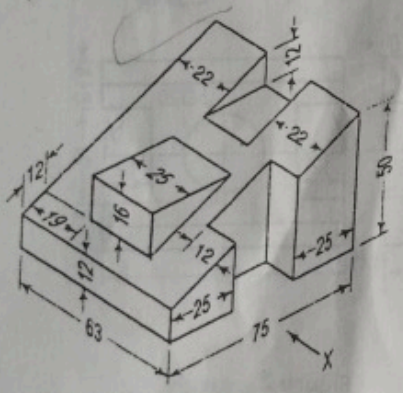


Figure 1

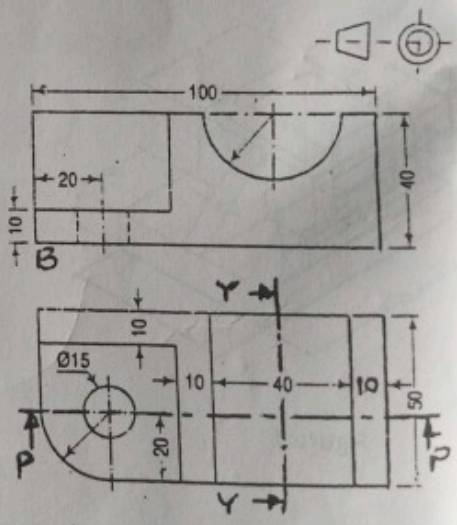
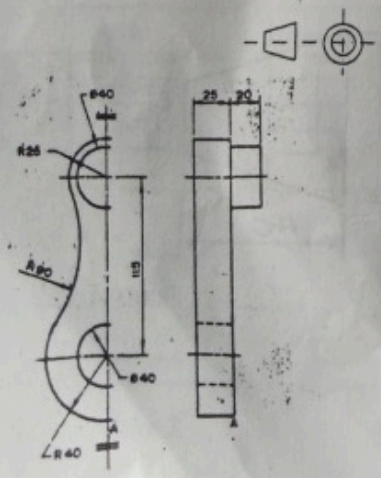


Figure 2



All Dimensions are in millimeters

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DEPARTMENT OF AGRICULTURAL ENGINEERING
2014/2015 RAIN SEMESTER EXAMINATIONS

COURSE: ENG 104 - ENGINEERING DRAWING II. TIME: 3 HOURS. DATE: 27/08/2015

INSTRUCTIONS: (i) Answer question 1 and any other three questions (ii) Write your names (in full) and registration number with ink (iii) Submit the following assignments in your manual to your respective lecturers on/before 31/08/2015 [pg 4 nos 1&3 ; pg 8 nos 1&2; pg 10 no 1; pg 17 no 1]

1. a. Draw the revolution convention of the steering of an automobile using your own dimensions.
   b. Using first angle orthographic projection, draw the front elevation, plan and the left hand side view of the object in Figure 1, viewed from direction X.

2. [illegible] of the views in Figure 2, such that point A is the lowest point on the drawing.

3. Two pieces of a material each 40 mm thick are to be secured together by a hexagonal bolt and nut, having major and minor diameters of 32 mm and 28 mm respectively. Draw a sectional view of the assembly. Norminal length of bolt is 120 mm.

4. Draw sections Y-Y as shown in Figure 2.

5. The front elevation of a truncated pentagonal prism is shown in Figure 3. The length of side of the pentagon is 30 mm. Draw (i) the plan view (ii) the development of the surface.

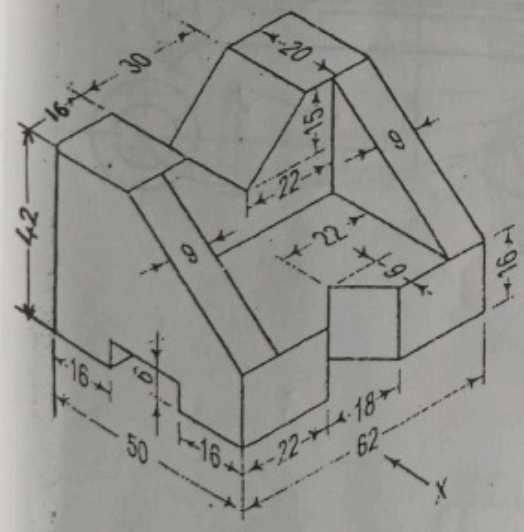


Figure 1

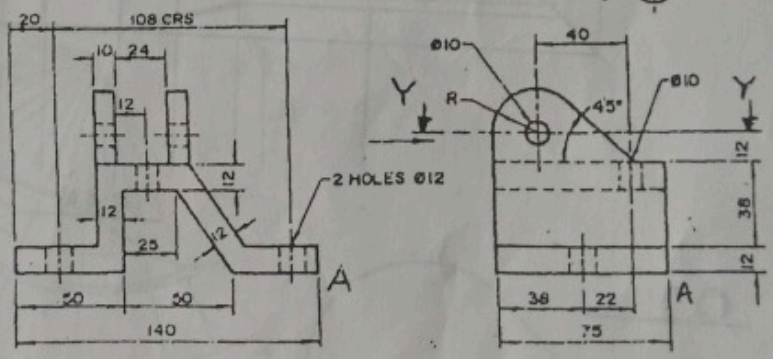


Figure 2

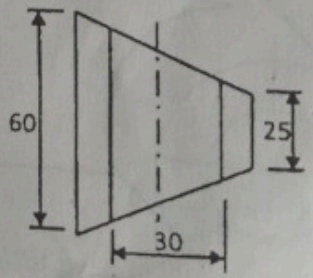
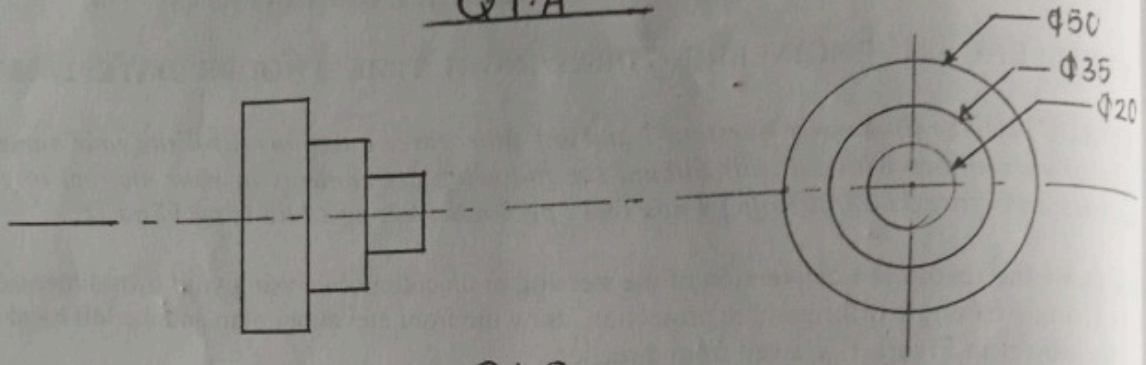


Figure 3

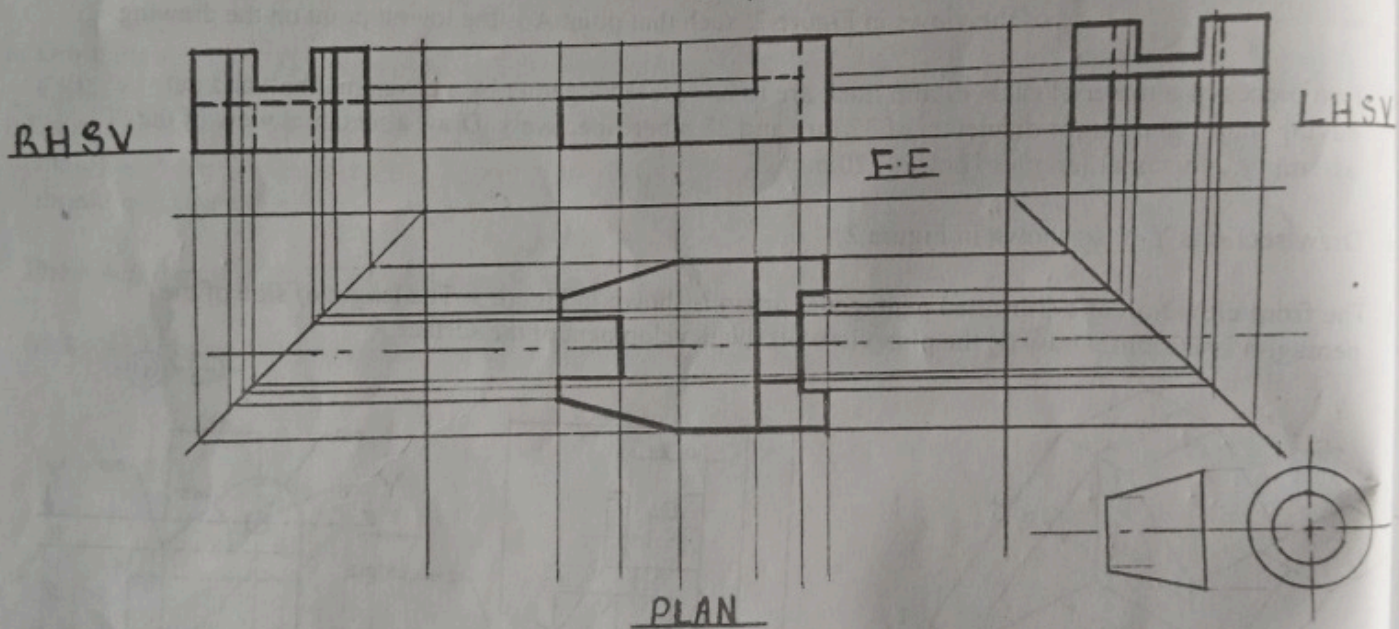
All dimensions are in millimeters

SOLUTION TO 2010/2011

Q1.A

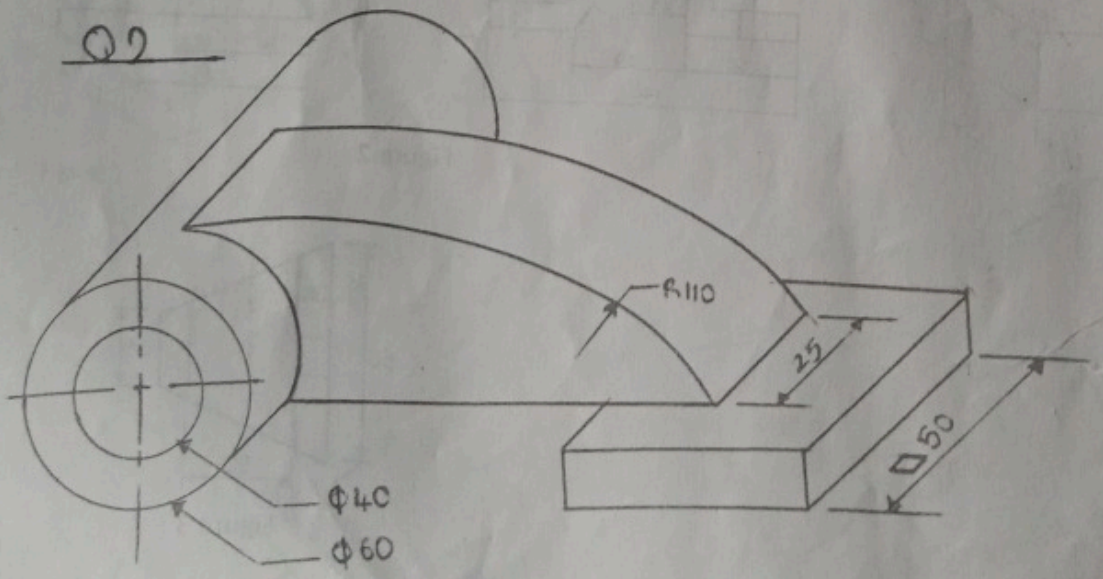


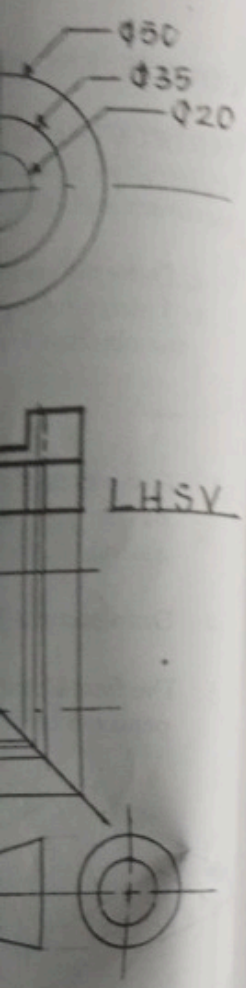
Q1.B



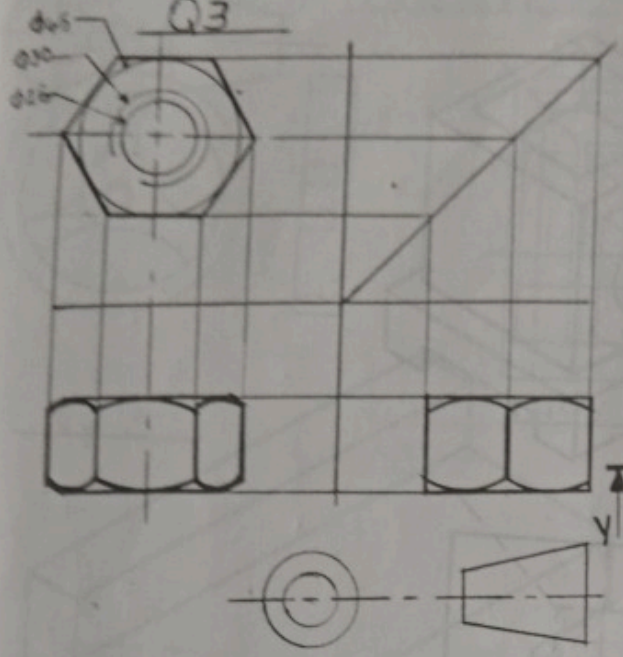
PLAN

Q2

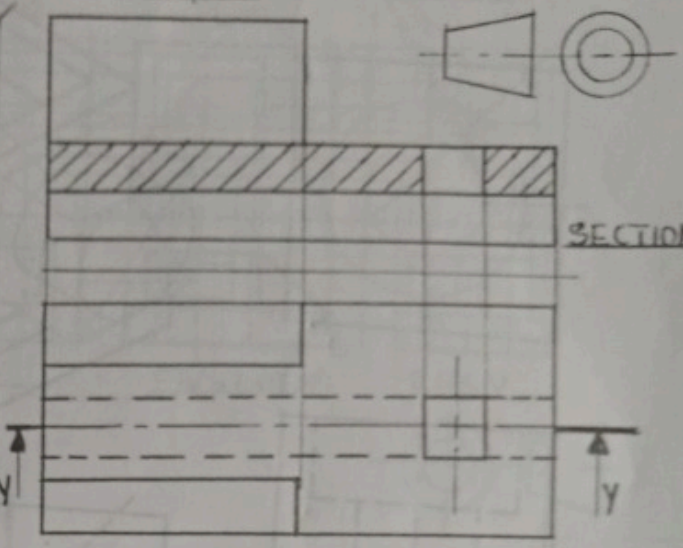


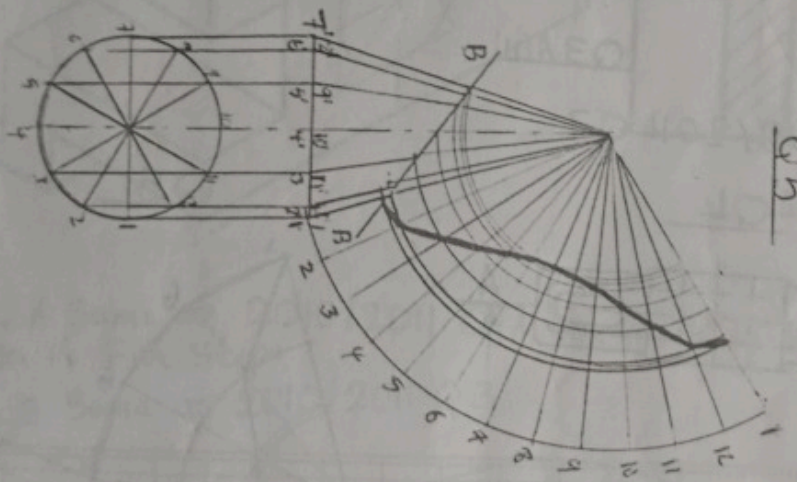


Q3



Q4

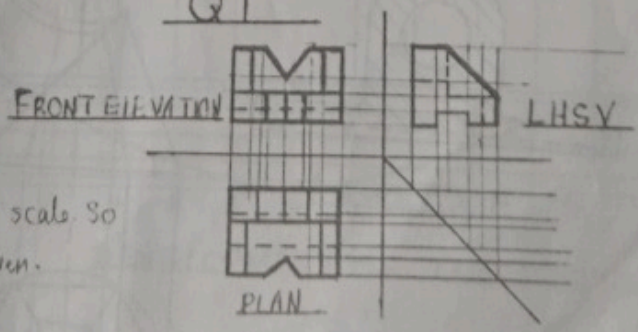




Q5

SOLUTION TO 2011/2012

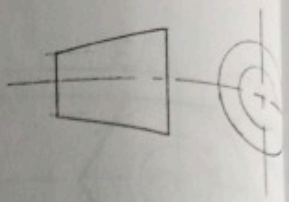
Q1



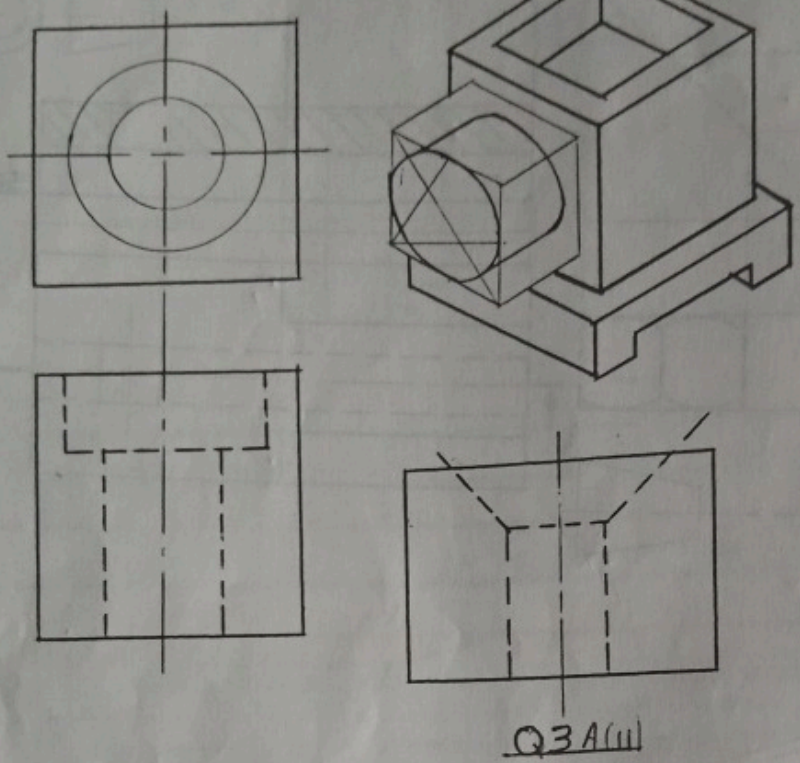
NOTE

This drawing is not to scale so follow the dimensions given.

Q2



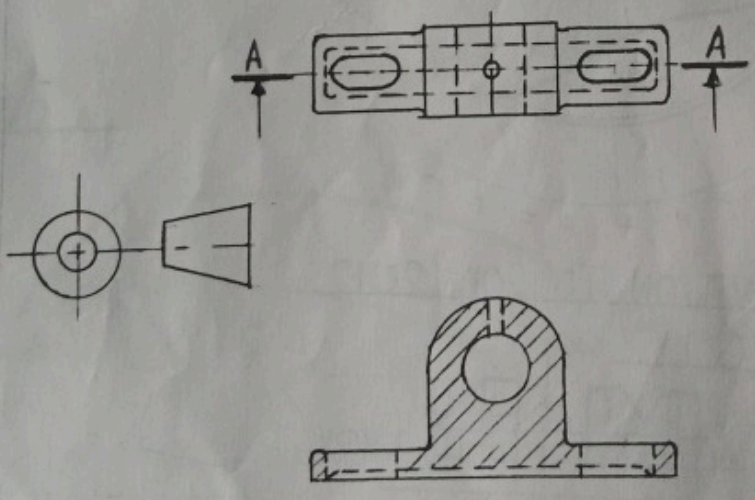
Q3 A(i)



Q3 A(iii)

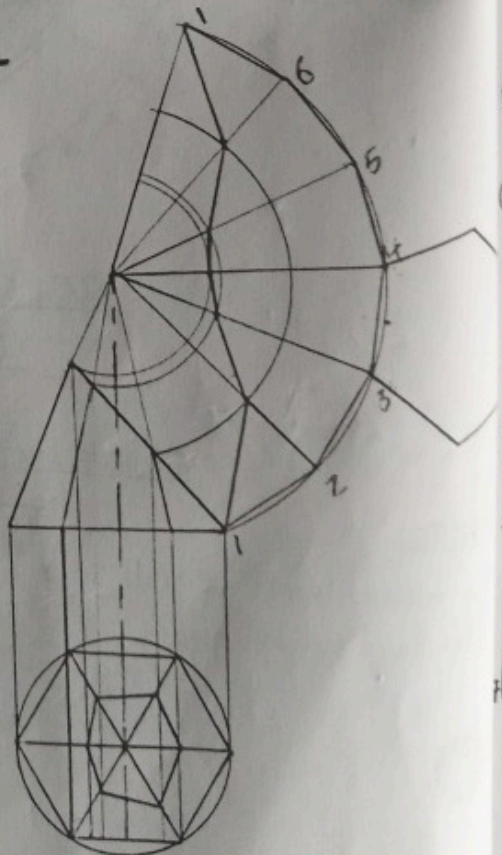
Q3B same as 2010/2011 Q3

Q4



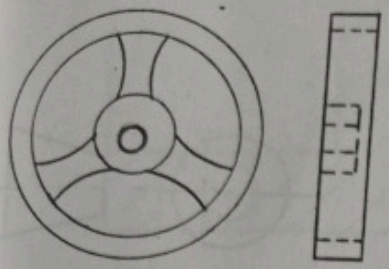
SECTION A-A

Q5

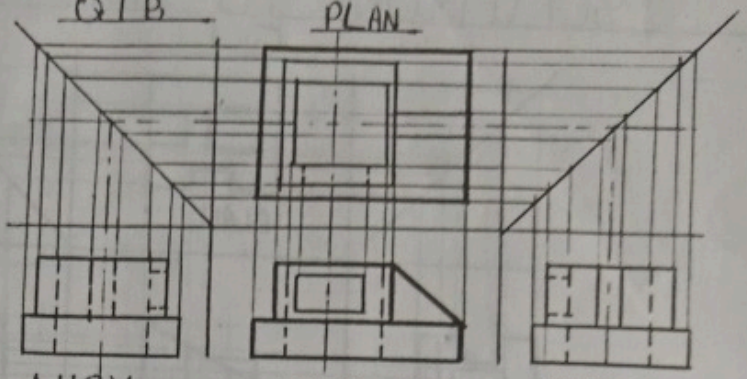


SOLUTION TO 2012/2013

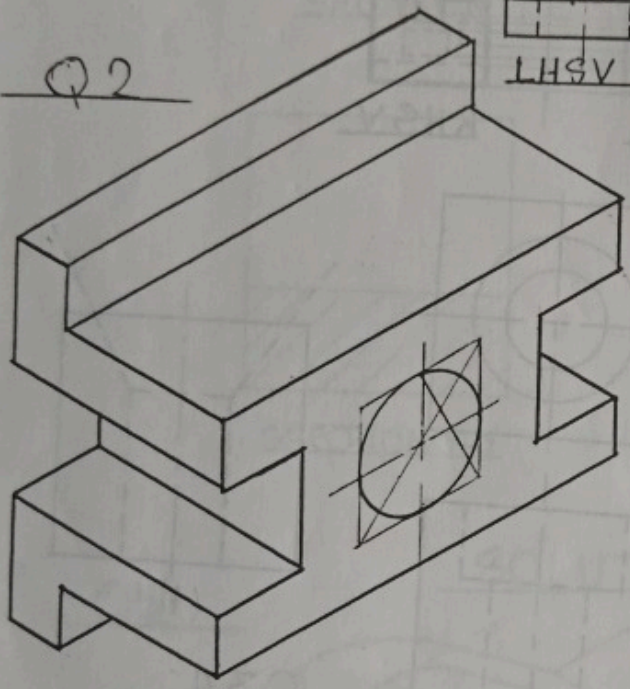
Q1A



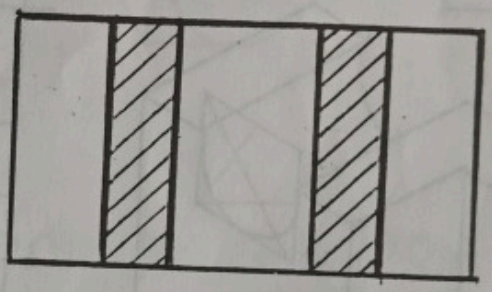
Q1B



Q2



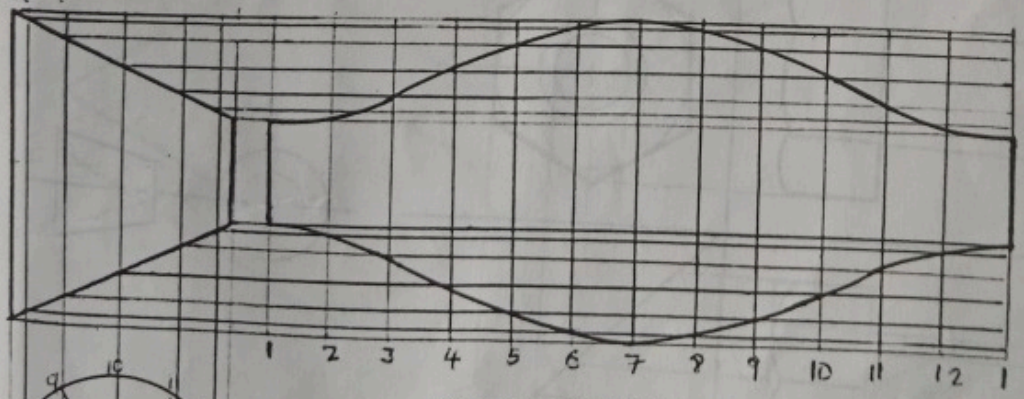
Q3



SECTION Y-Y

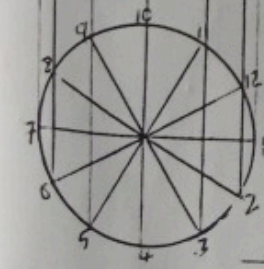
Q4 A Same as 2010/2011 Q1A. Here you have to add two more steps to make it Five. Steps

Q4B Same as 2010/2011 Q3



DEVELOPMENT OF THE SURFACE

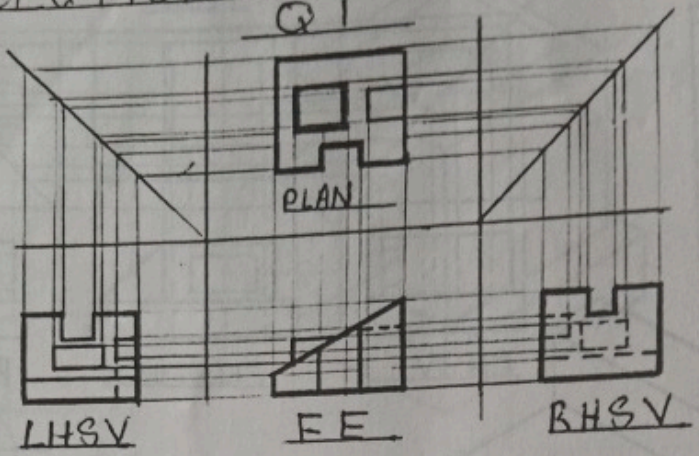
Q5

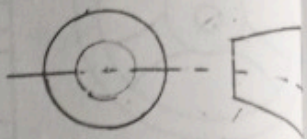


PLAN VIEW

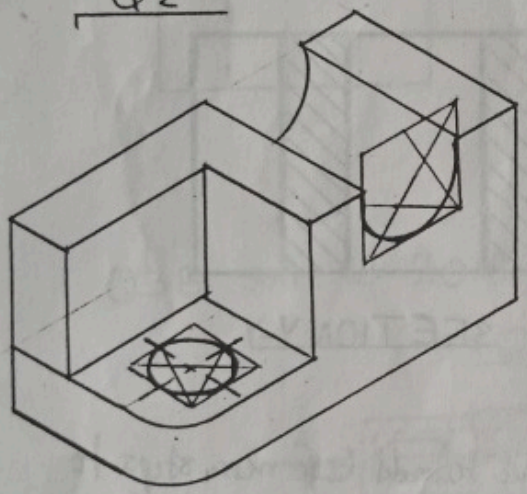
SOLUTION TO 2013/2014

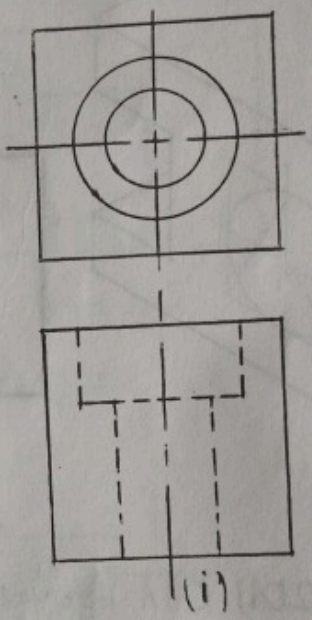
Q1

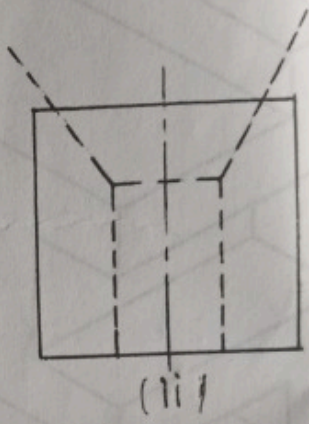




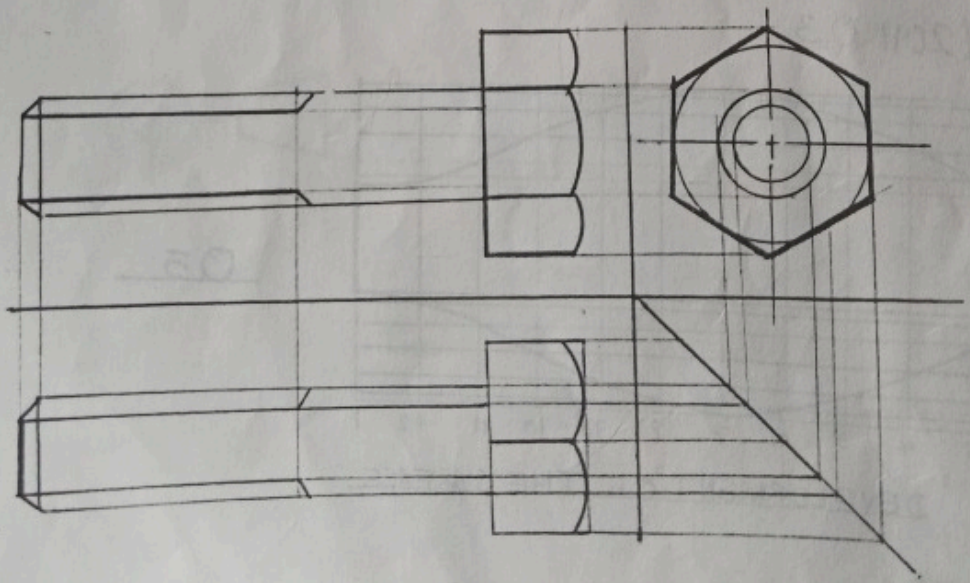
Q2

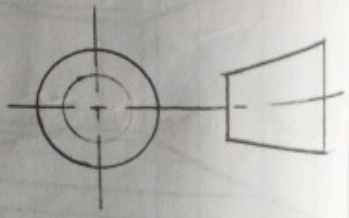






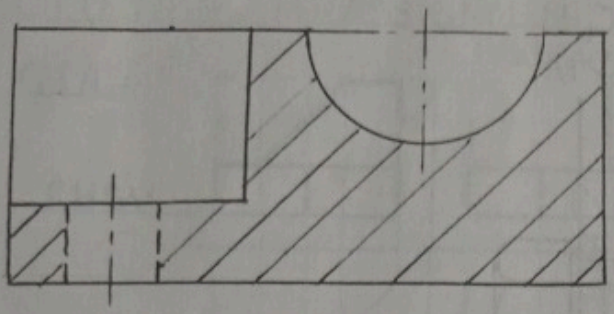
Q3A



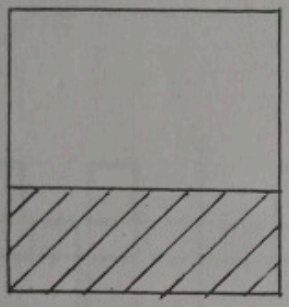


Q3B

Q4

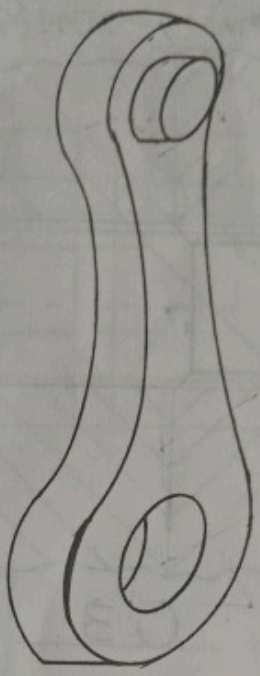


SECTION PP



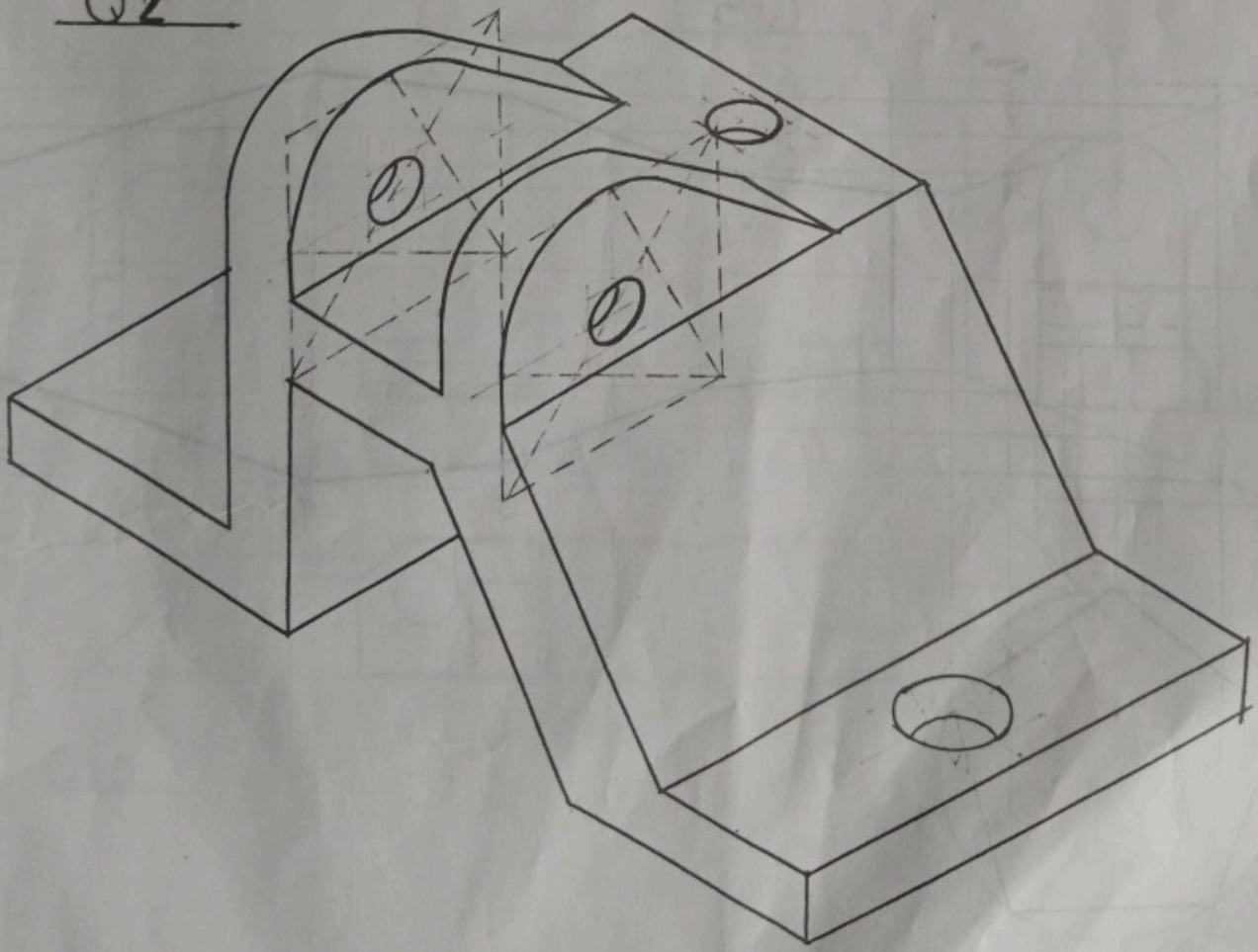
SECTION Y-Y

Q5

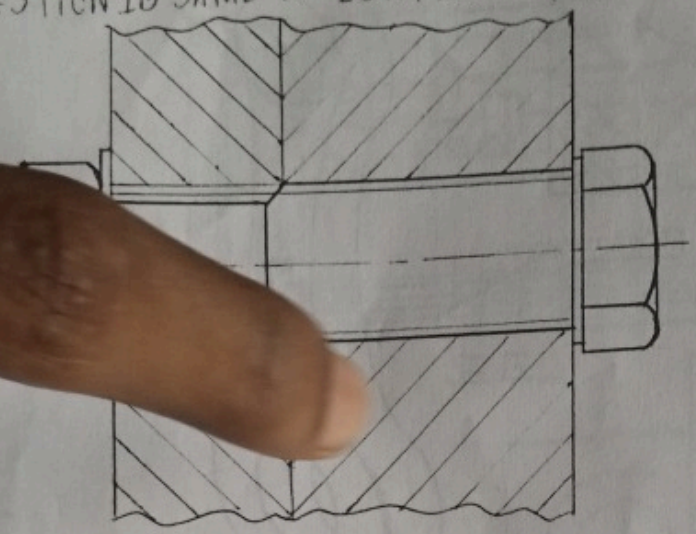


SOLUTION TO 2014/2015

Q2



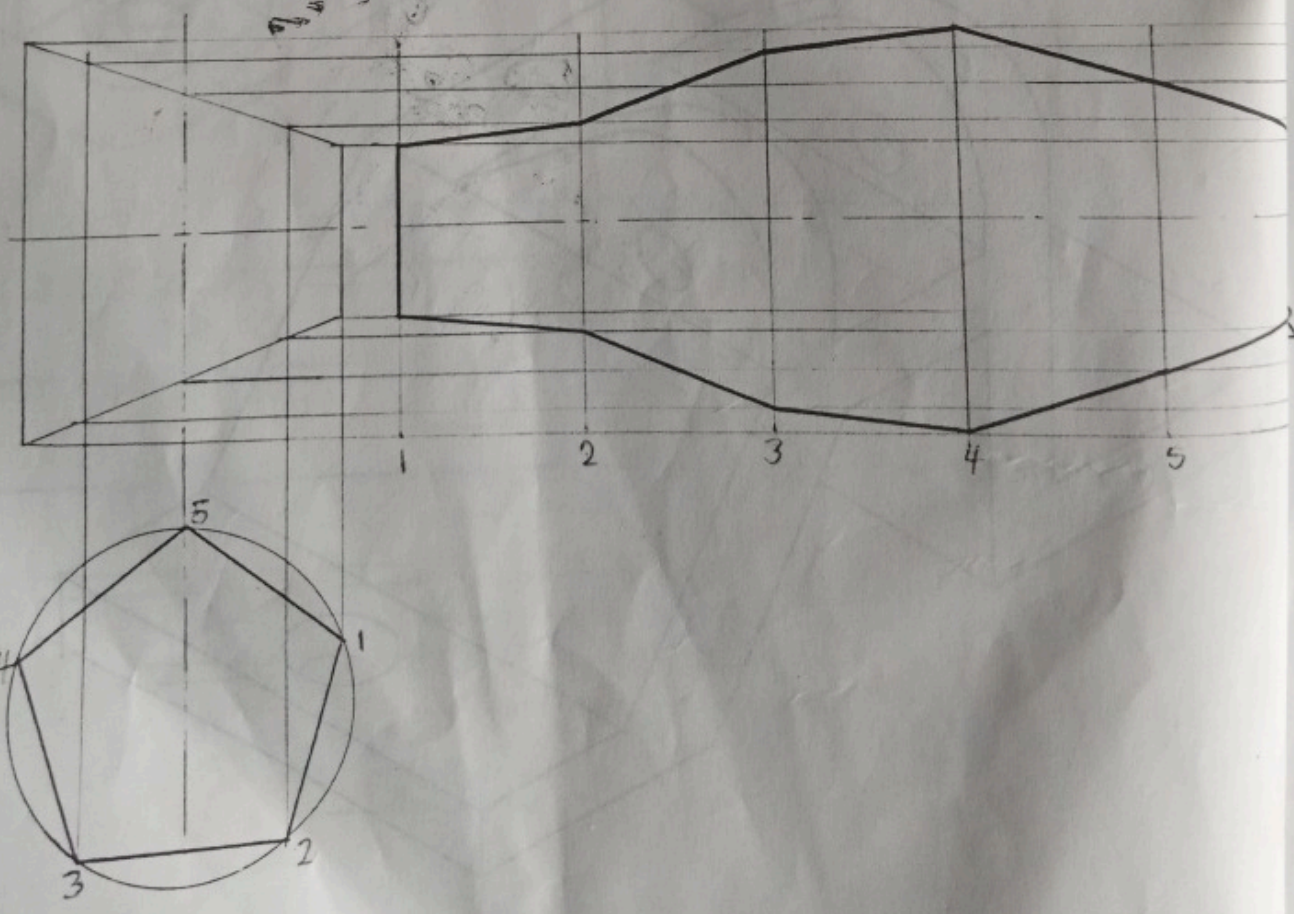
QUESTION 1A SAME AS 2011/2012 Q1
QUESTION 1B SAME AS 2012/2013 Q1A



Q3

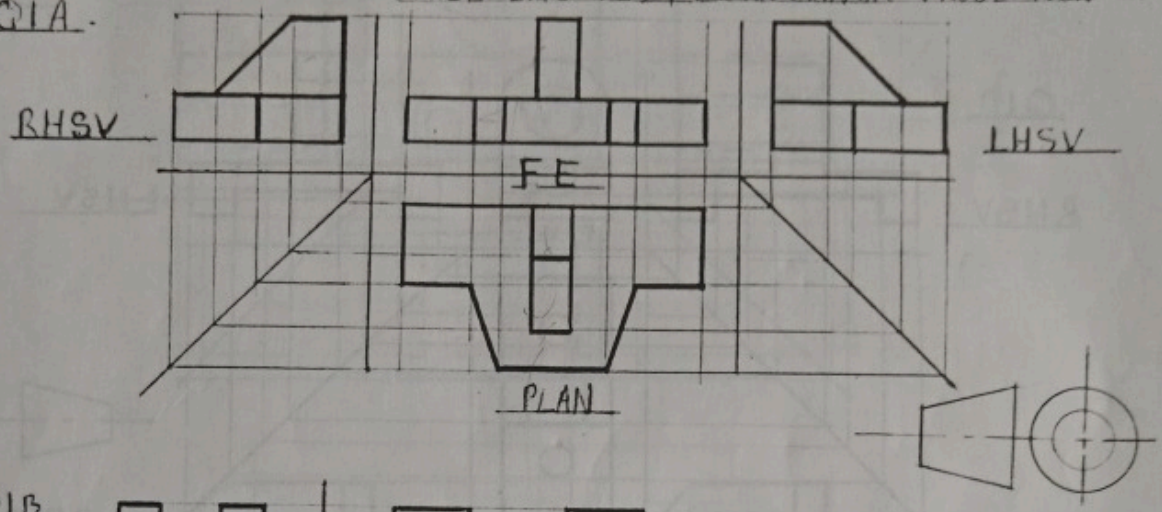
3C

Q5

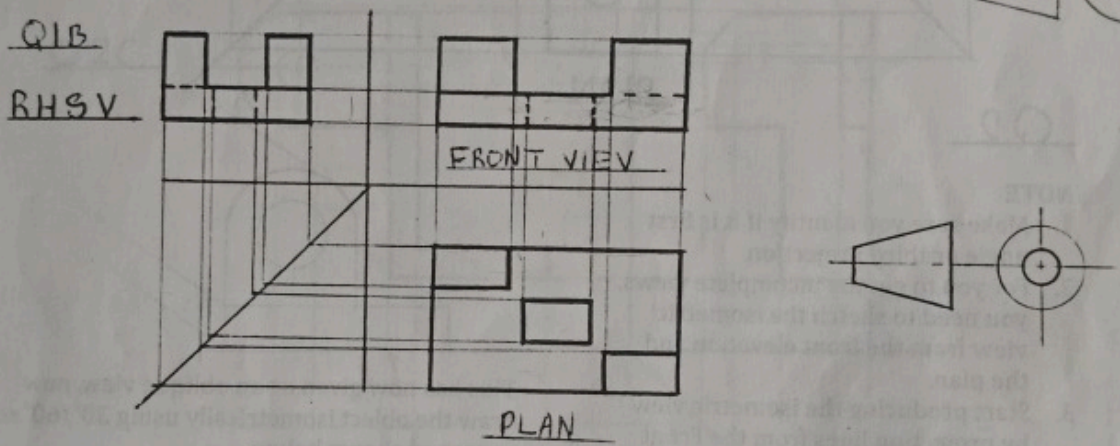


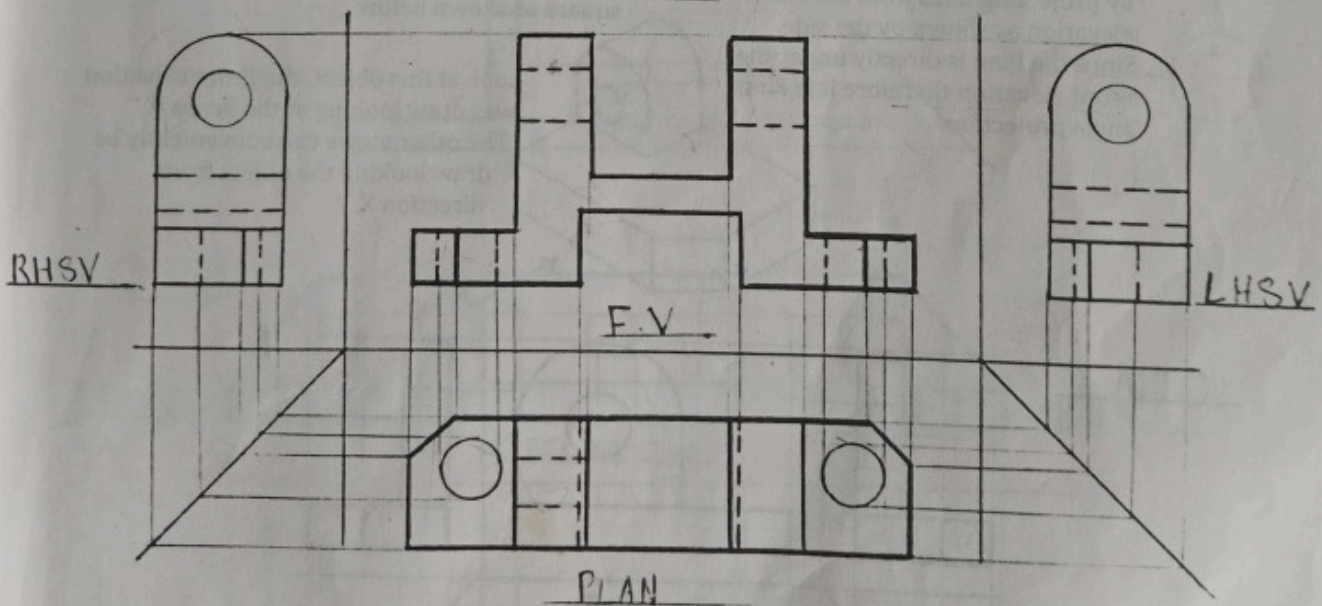
SOLUTION TO ASSIGNMENT ON FOUNDATION TEXT BOOK
PAGES (146-152) ORTHOGRAPHIC PROJECTION

Q1A.

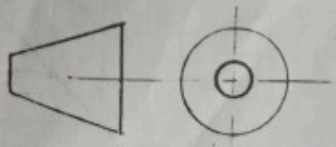


Q1B

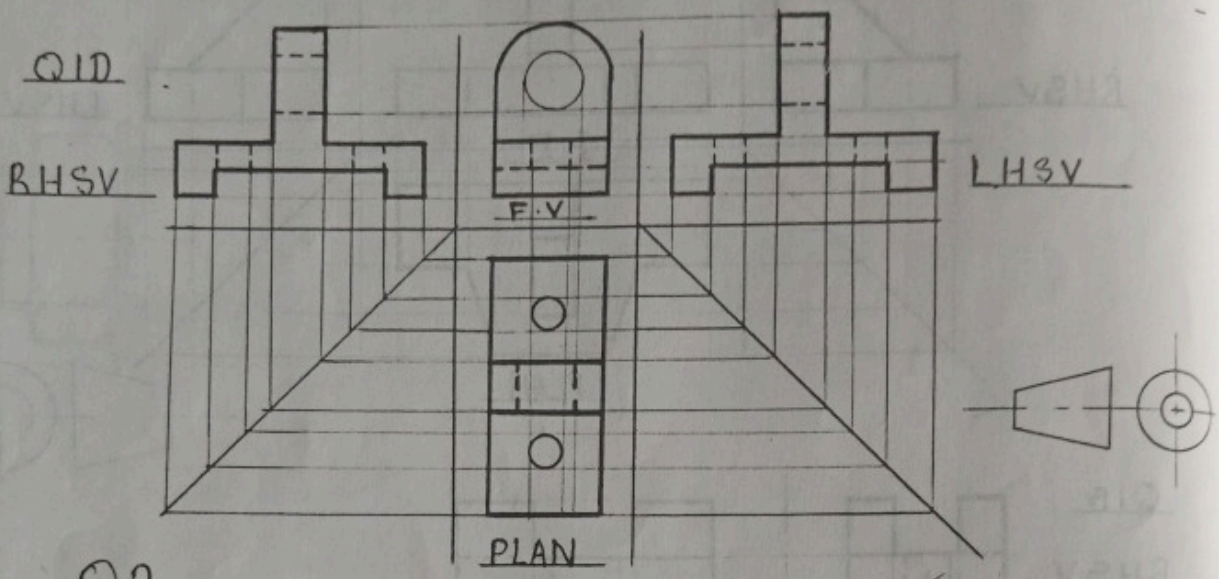




Q1C.



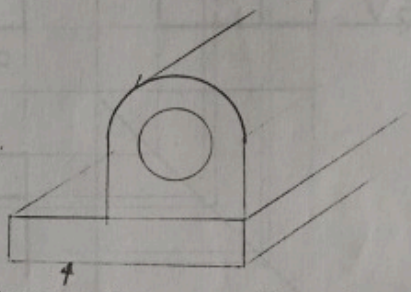
Q1D



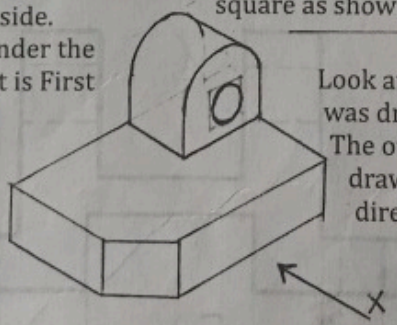
Q2

NOTE

1. Make sure you identify if it is first angle or third projection
2. For you to get the incomplete views, you need to sketch the isometric view from the front elevation and the plan.
3. Start producing the isometric view by projecting lines from the Front elevation as shown by the side.
4. Since the Plan is directly under the Front elevation therefore it is First angle projection.

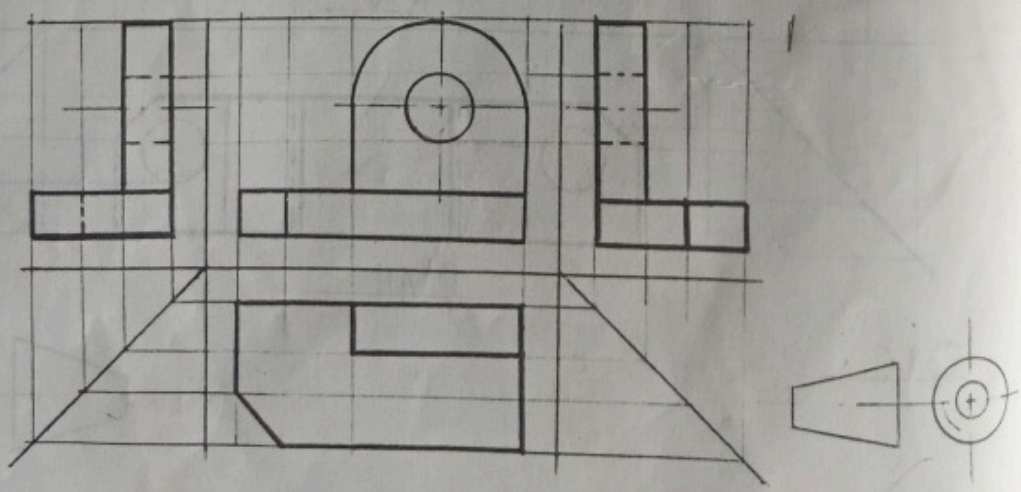


This has now given us an oblique view, now draw the object isometrically using $30^0/60^0$ set square as shown below.

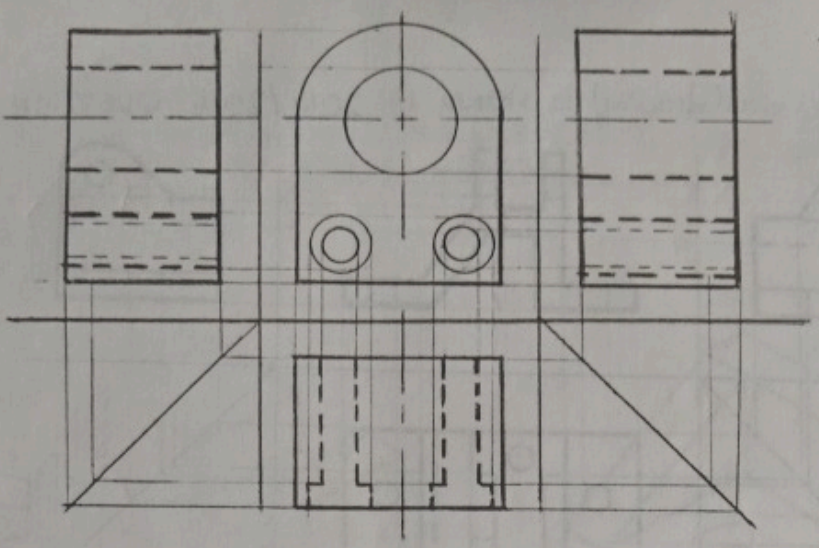


Look at this object, the Front elevation was draw looking at the arrow X. The other views can conveniently be draw looking the object from direction X.

Q2A

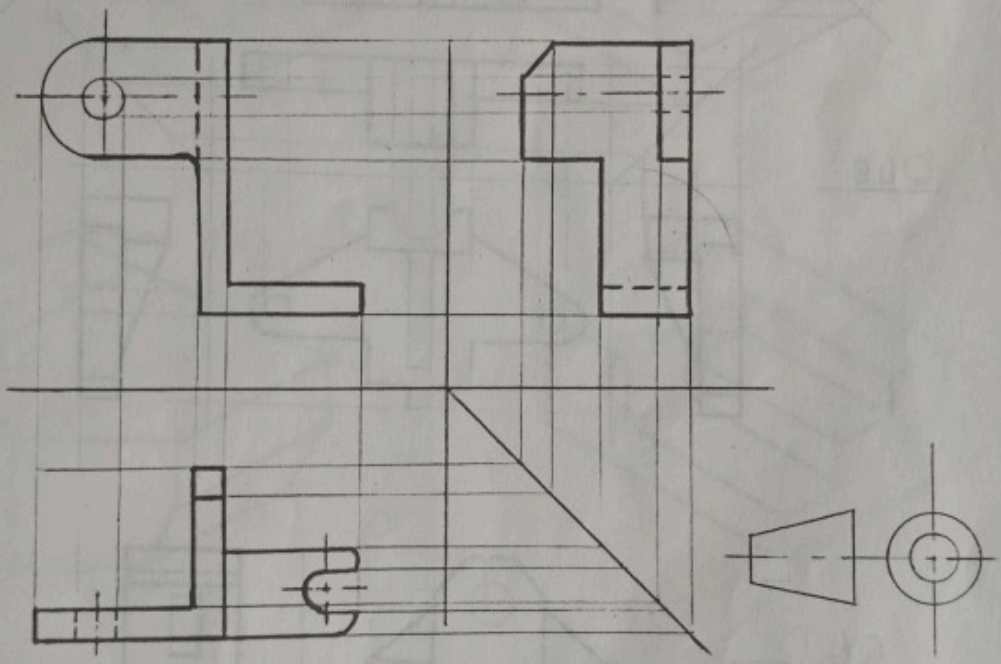


Q2B

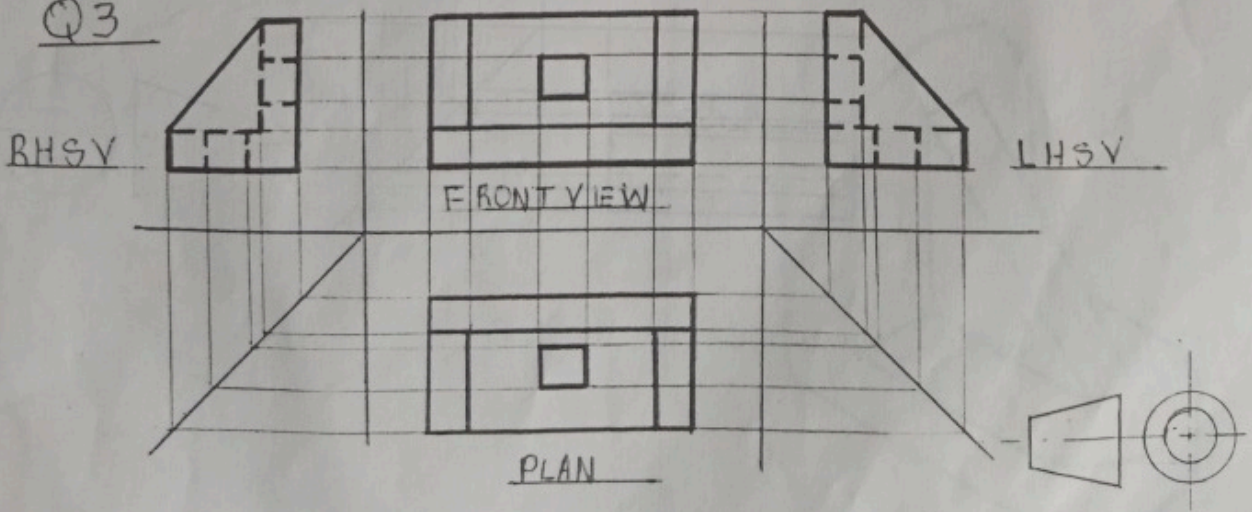


2

Q2C



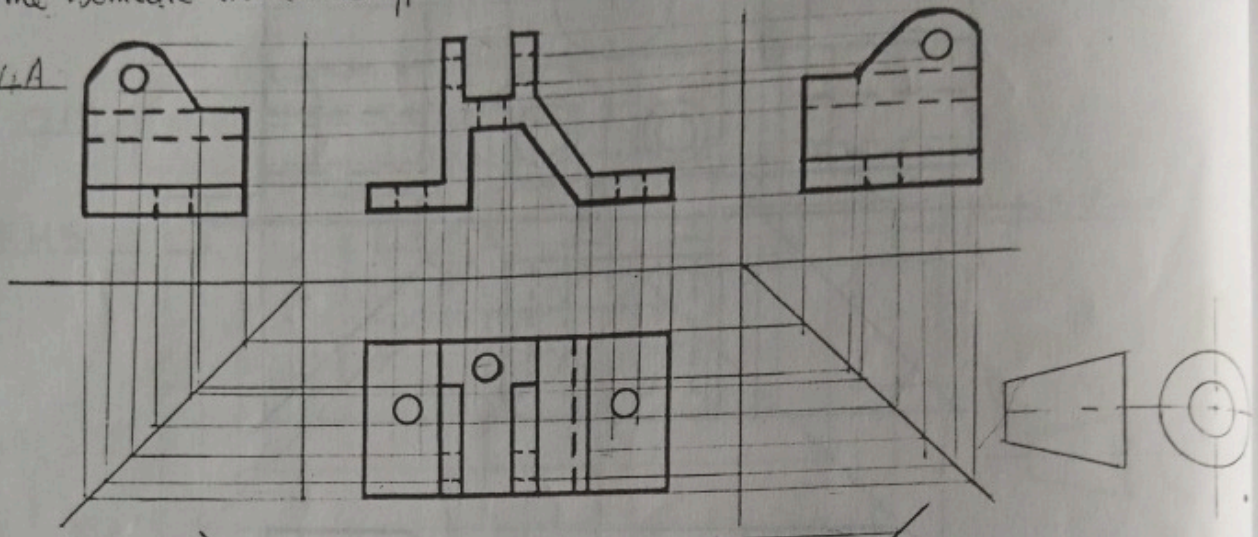
Q3



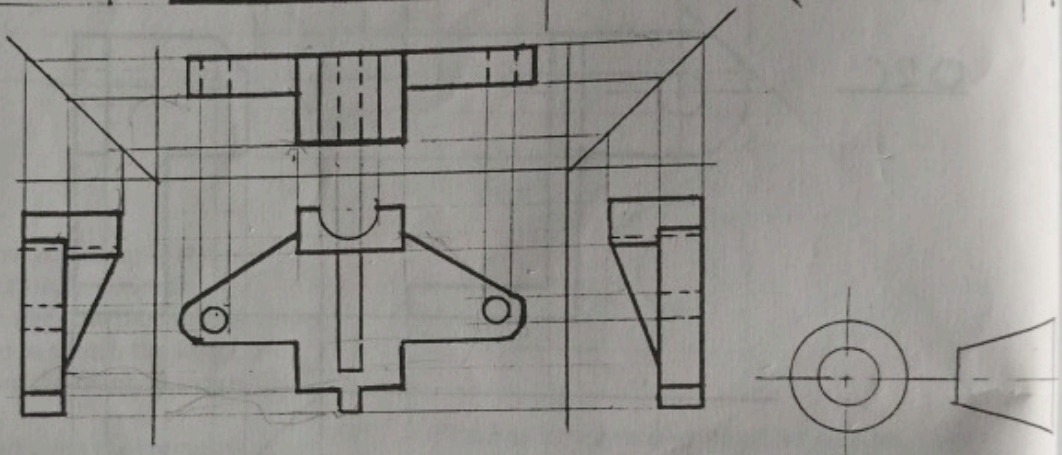
6

Q4
The Isometric view(drawing) is shown in 2014/2015 QUESTION N=2

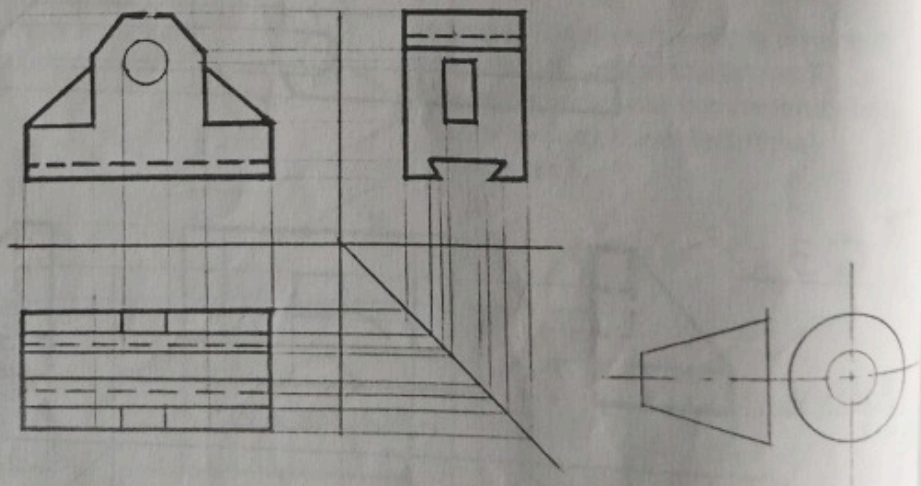
Q4A



Q4B



Q4D

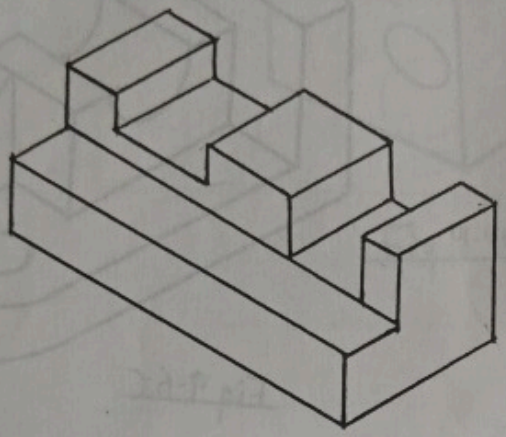


Q4 C has the same concept as 4B.

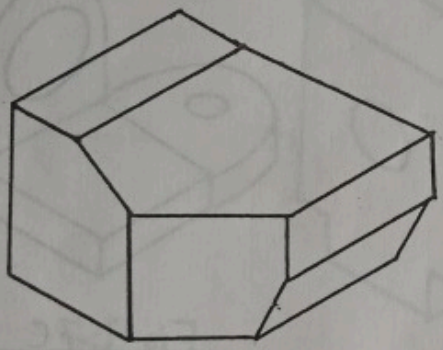
SOLUTIONS TO EXERCISE ON FOUNDATION TEXT BOOK (Pg 171-176)

PICTORIAL DRAWING

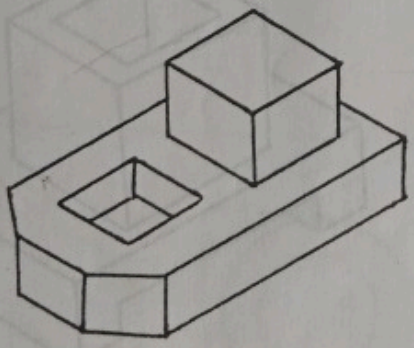
2



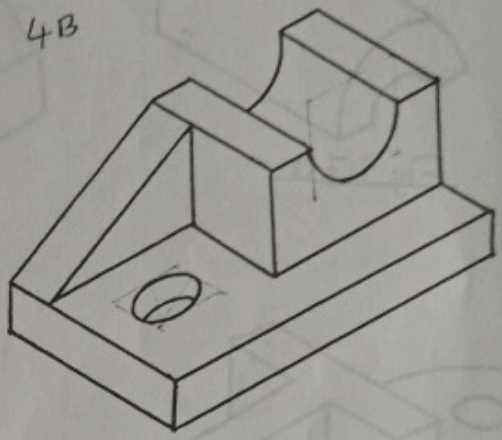
3



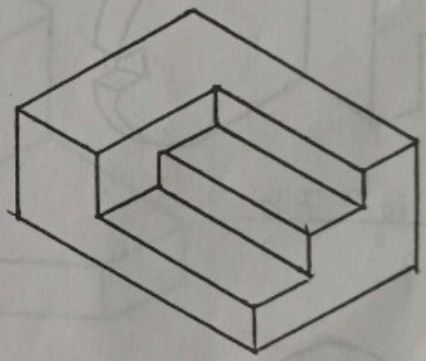
4A



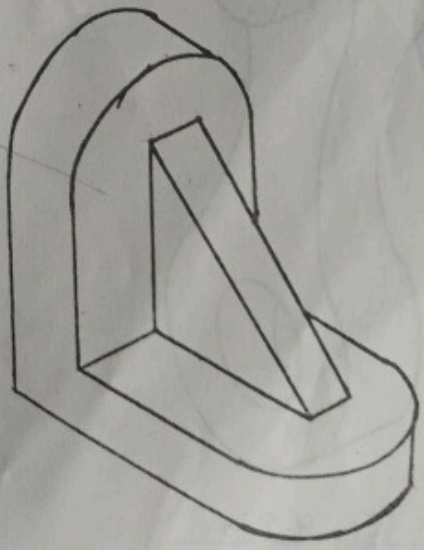
4B



6A



6B



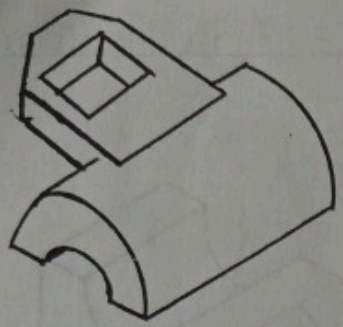


Fig 9.7a

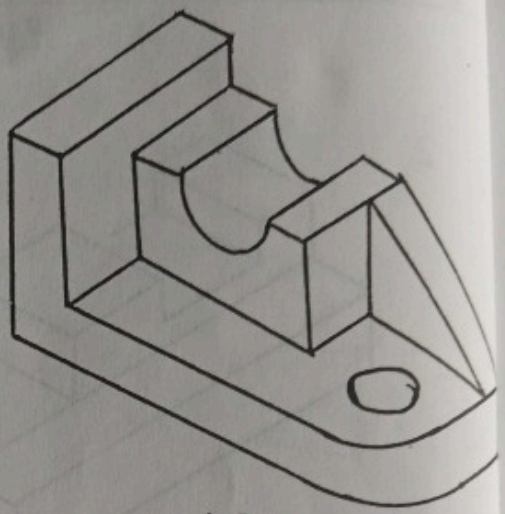


Fig 9.6C

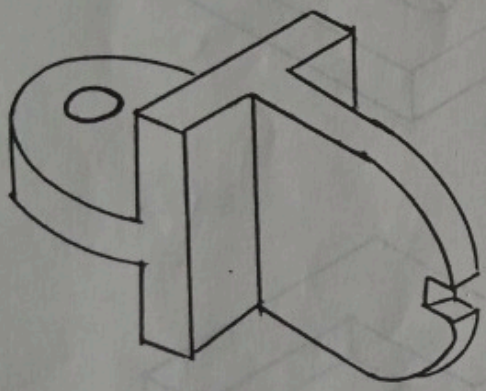


Fig 9.7b

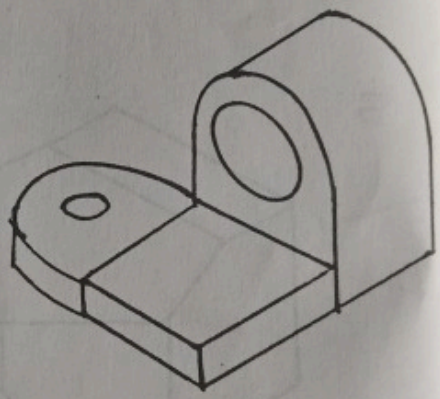


Fig 9.7C

Fig 9.8b

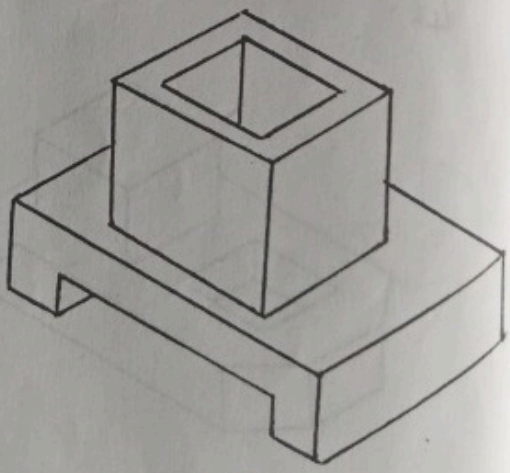


Fig 9.8a

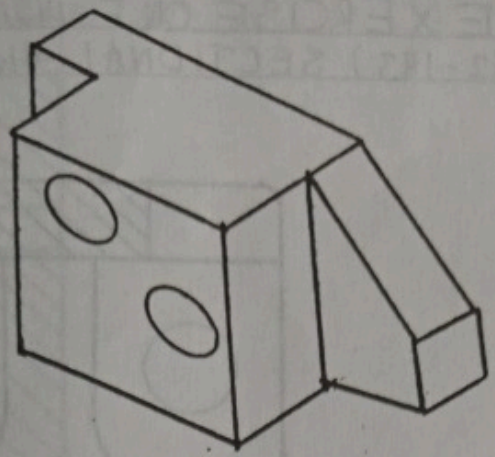


Fig 9.9C

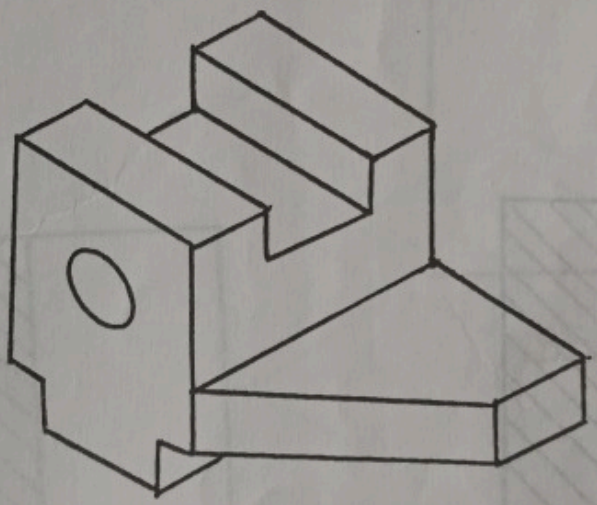


Fig 9.9 b

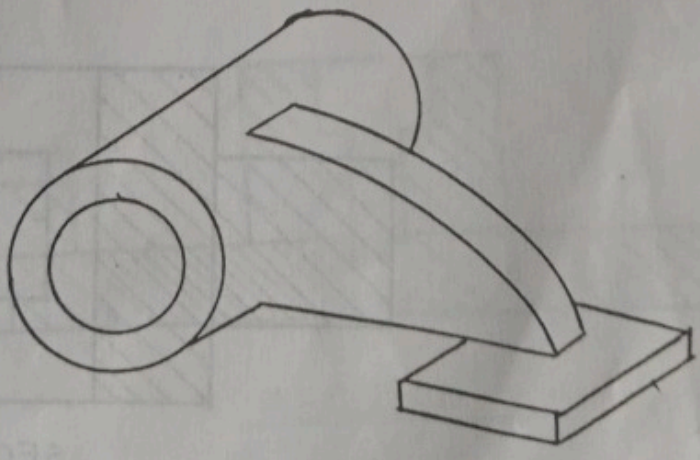


Fig 9.8C

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING
2015/2016 RAIN SEMESTER EXAMINATIONS
COURSE: ENG 104 - ENGINEERING DRAWING 11. TIME: 3 HOURS. DATE: 23/09/2016

INSTRUCTIONS: (i) Answer question 1 and any other three questions (ii) Write your name (in full) and registration number with ink (iii) Submit the following assignments in your manual to your respective lecturers on/before 30/09/2016 [pg 4 nos 1&3 ; pg 8 nos 1&2; pg 10 no 1; pg 17 no 1]

1. a. Draw the conventional representation of these holes: (i) 18 Drill-30 C/Bore, 12 Deep (ii) 14 Drill 82^0 CSK, 29 DIA.
   b. Using first angle orthographic projection, draw the front elevation, plan and the left hand side view of the object in Figure 1, viewed from direction T.

2 Make isometric drawing of the views in Figure 2, such that point B is the lowest point on the drawing.

3 a. Draw the conventional representation of a five step pulley, having diameters: 30, 40, 48, 55 and 60 mm.
   b. Using third angle projection, draw three views of an M 30 hexagonal bolt with a washer faced end, having a pitch of 4 mm and a nominal length of 120 mm. Show the thread end chamfered.

4. a. Make an oblique drawing of the views in Figure 3 such that the face A faces the observer.
   b. Draw sections A-A as shown in Figure 2.

5. The front elevation of a truncated pentagonal prism is shown in Figure 4. The length of side of the pentagon is 30 mm. Draw (i) the plan view (ii) the development of the surface.

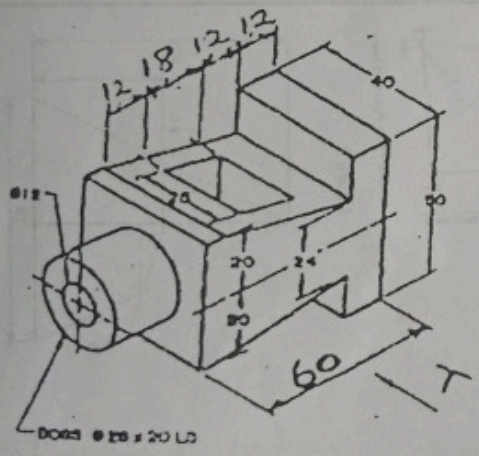


Figure 1

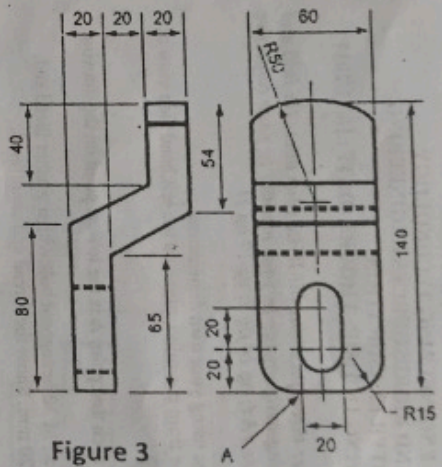


Figure 3

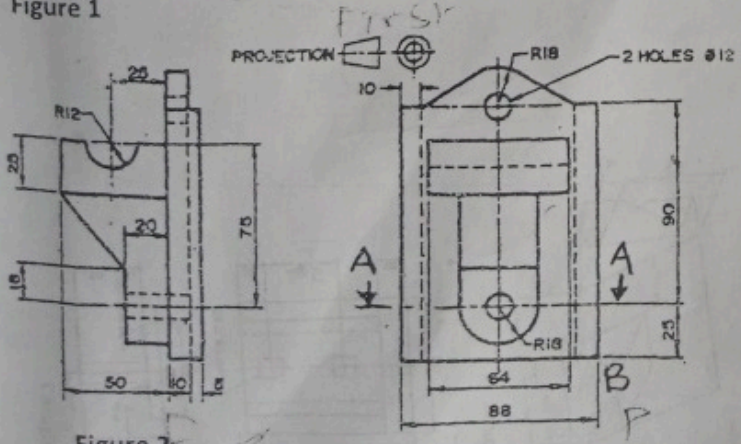


Figure 2

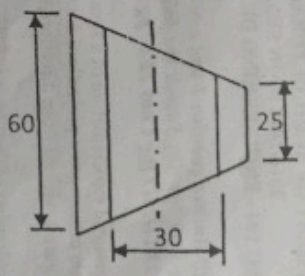


Figure 4

All dimensions are in millimeters

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING
2016/2017 RAIN SEMESTER EXAMINATION
COURSE: ENG 104 - ENGINEERING DRAWING 11. TIME: 3 HOURS. DATE: 16/11/2017

INSTRUCTIONS: (i) Answer question 1 and any other three questions (ii) Write your name (in full) and registration number with ink (iii) Submit the following assignments in your manual to your respective lecturers on/before 22/11/2017 [pg 4 nos 2&4 ; pg 8 nos 1&4; pg 14 fig 7; pg 17 no 1]

1. a. Draw the conventional representation of a spur gear using your own dimensions.
   b. Using third angle orthographic projection, draw the front elevation, plan and the left hand side view of the object in Figure 1, viewed from direction A.

2 Make isometric drawing of the views in Figure 2, such that point A is the lowest point on the drawing.

3 Using third angle projection, draw three views of an M 30 hexagonal bolt with a washer faced end, having a pitch of 4 mm and a nominal length of 120 mm. Show the thread end chamfered.

4. a. Copy the views in Figure 2 and draw section Y-Y
   b. Make an oblique drawing of the complete view of the plate in Figure 3.

5 The front elevation of a truncated cone, cut along plane B-B is shown in Figure 4. Copy the front elevation, draw the plan view, and draw the development of the surface.

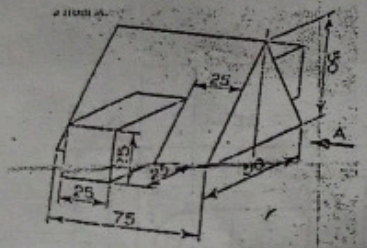
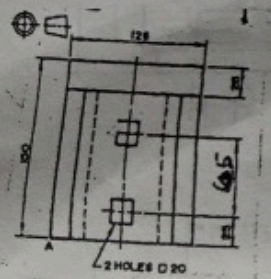


Figure 1



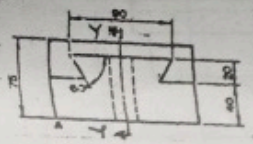


Figure 2

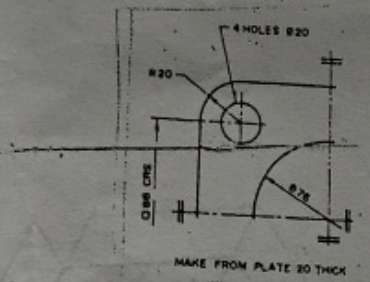


Figure 3

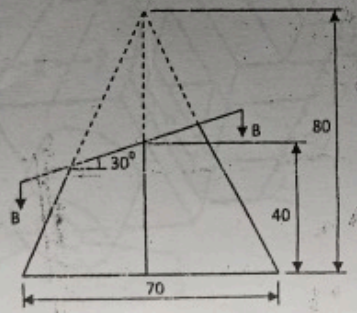


Figure 4

All dimensions are in millimeters

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING
2017/2018 RAIN SEMESTER EXAMINATION
COURSE: ENG 104 - ENGINEERING DRAWING 11. TIME: 3 HOURS. DATE: 14/09/2018

INSTRUCTIONS: (i) Answer question 1 and any other three questions (ii) Write your name (in full) and registration number with ink (iii) Submit the following assignments in your manual to your respective lecturers on/before 19/09/2018 [pg 4 no 3; pg 8 nos 2&3; pg 14 fig 7; pg 17 no 1]

1. a. Draw the revolution convention of a circular flange of diameter 80 mm and thickness of 10 mm.
   b. Using first angle orthographic projection, draw the front elevation, plan, left hand side view, and right hand side view of the object in Figure 1, viewed from direction A.

2 Make isometric drawing of the views in Figure 2, such that point X is the lowest point on the drawing.

3 Two pieces of a material each 40 mm thick are to be secured together by a hexagonal bolt and nut, having major and minor diameters of 32 mm and 28 mm respectively. Draw a sectional view of the assembly. Nominal length of bolt is 120 mm.

4. a. Copy the views in Figure 2 and draw section Y-Y

5 The front elevation of a truncated pentagonal prism is shown in Figure 3. The length of side of the pentagon is 30 mm. Draw (i) the plan view (ii) the development of the surface.

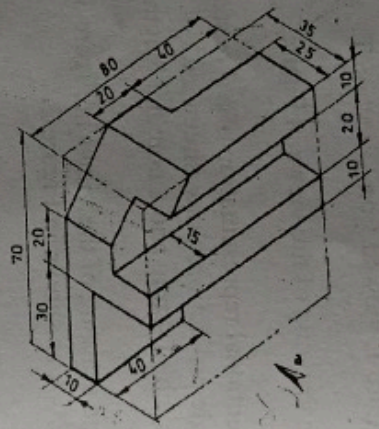


Figure 1

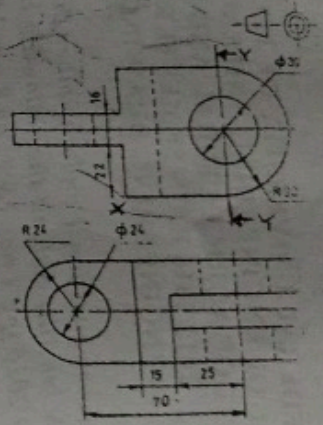
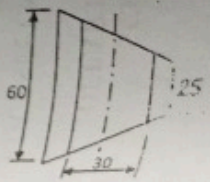


Figure 2



Figure

All dimensions are in millimeters

CCE SURE A ENG 104

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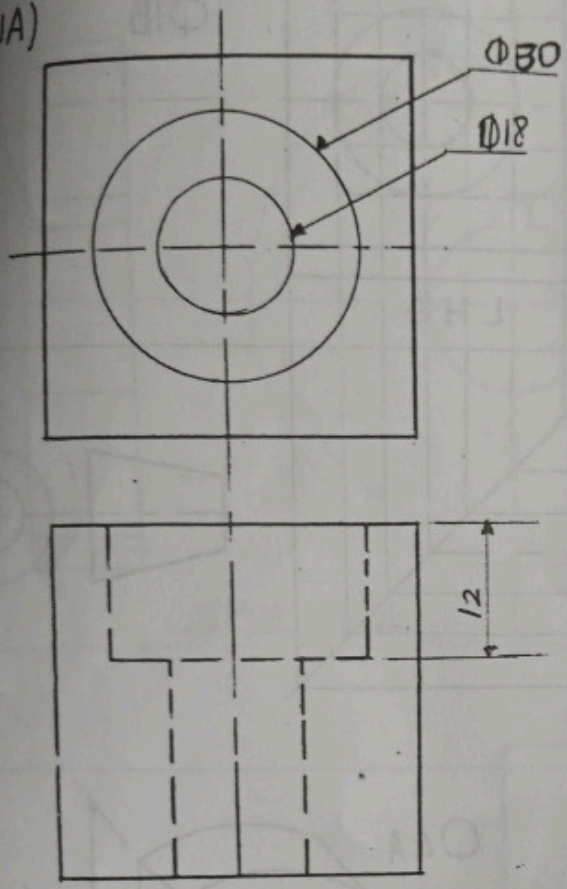
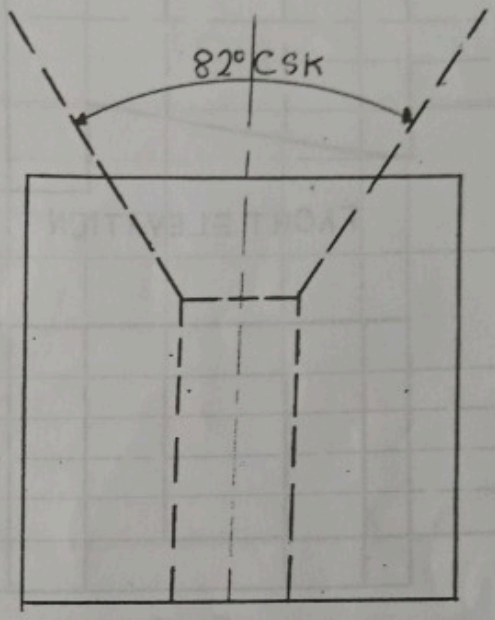
Q1A)

SOLUTION TO 2015/2016

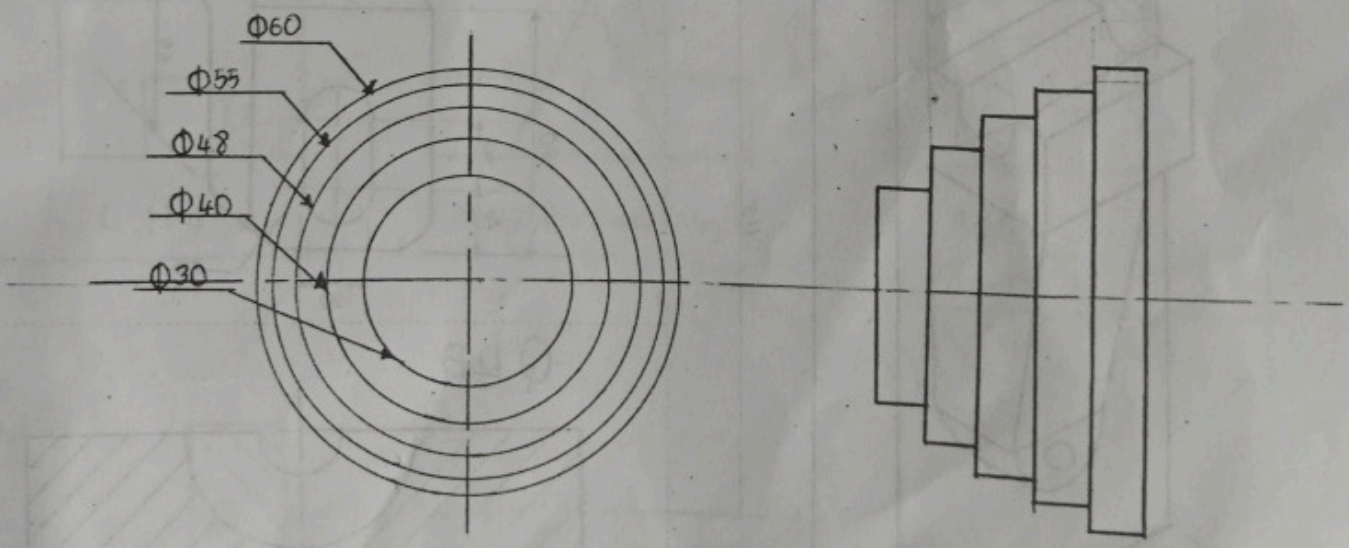
Q1A)



Q1A-II)

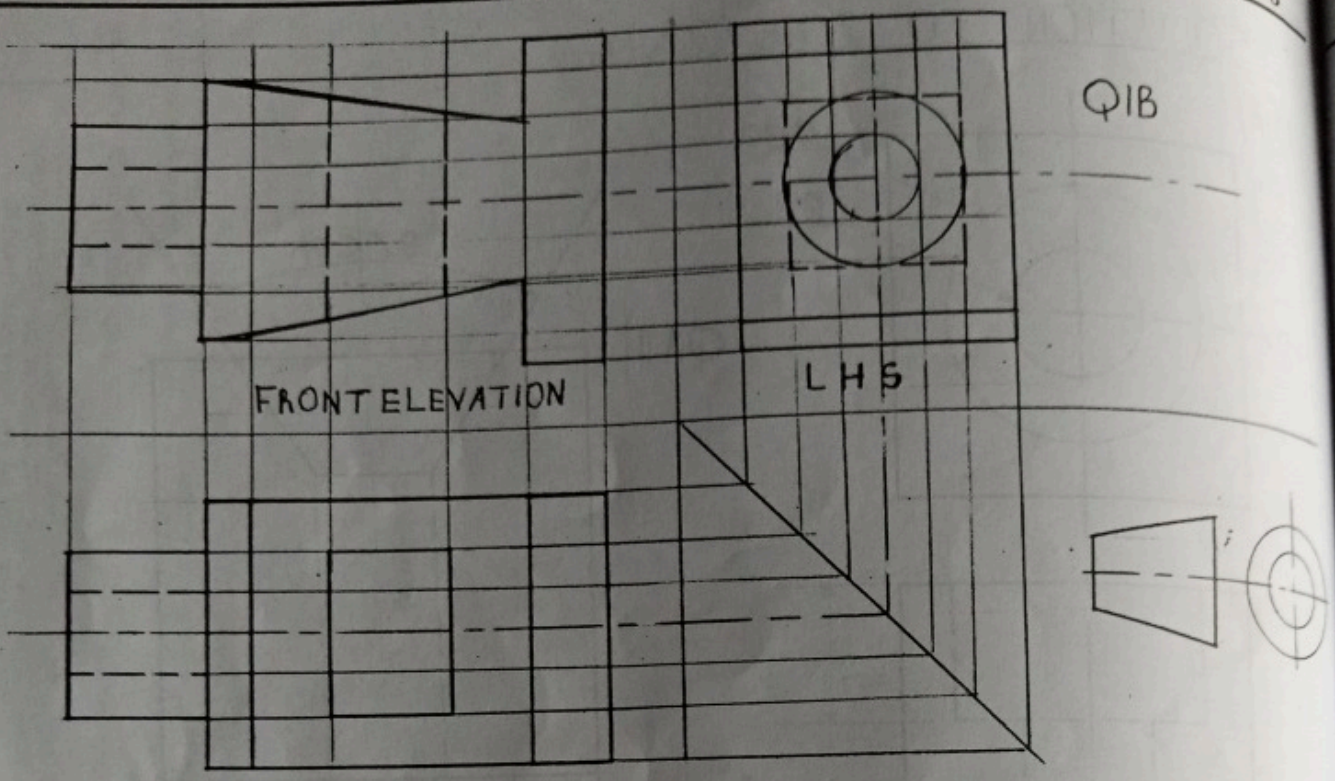


Q3A

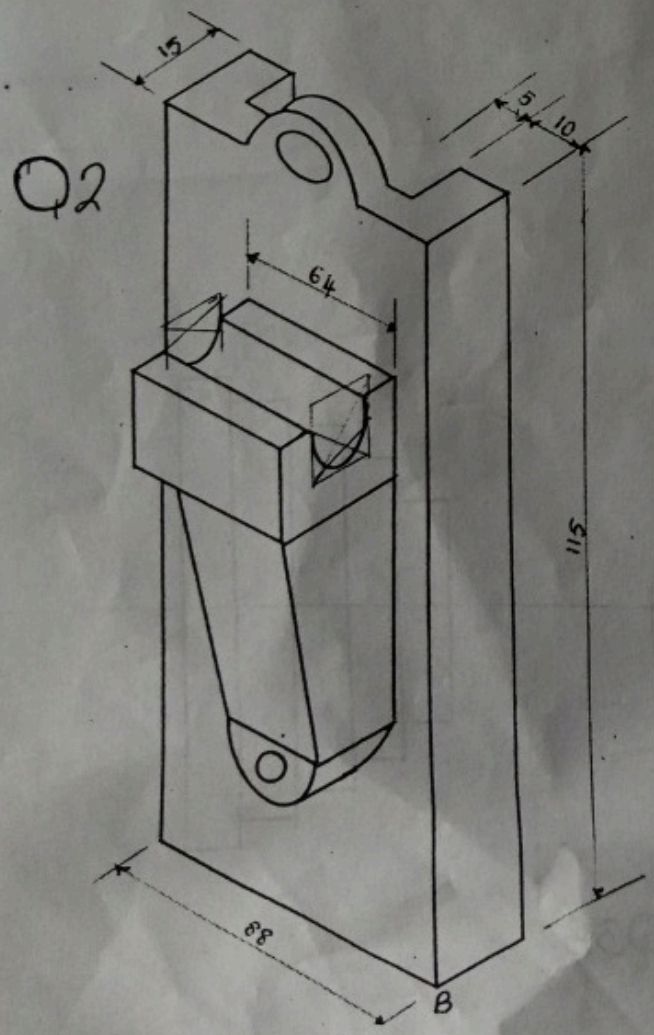


Q3B. SAME AS 2013/2014 Q3B.

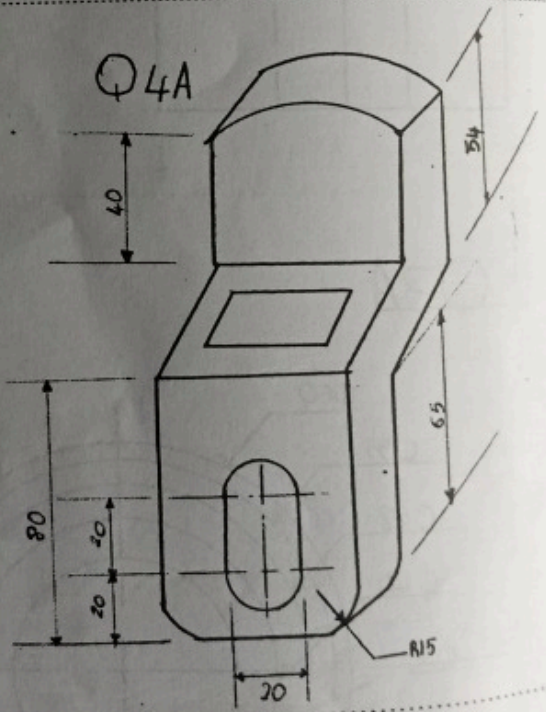
Q1B



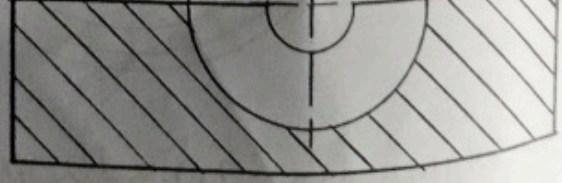
Q2



Q4A



Q4B

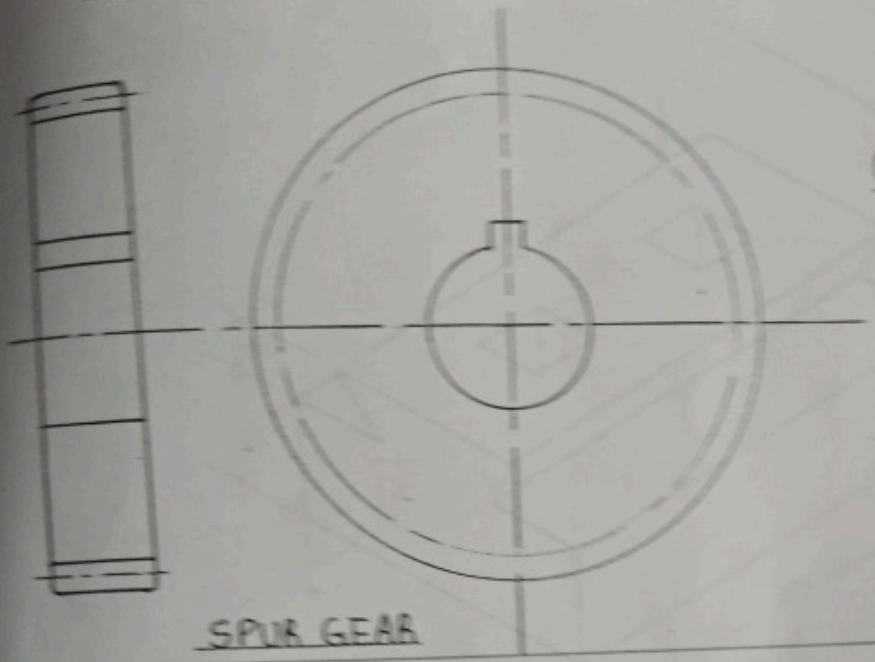


SECTION A-A

Q5 SAME AS 2014/2015 Q5

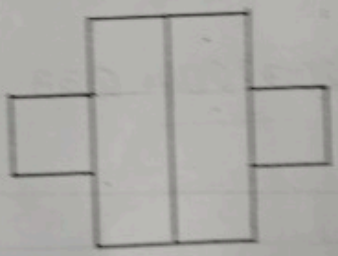
SOLUTION 2016/2017

Q1A

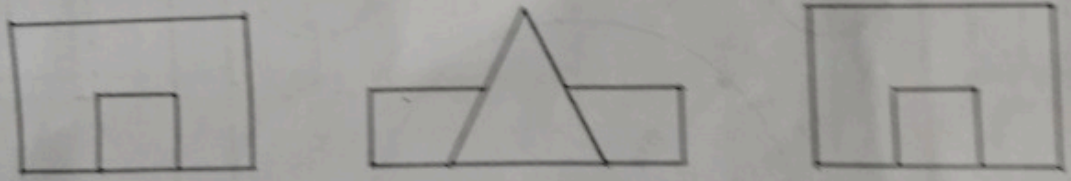


SPUR GEAR

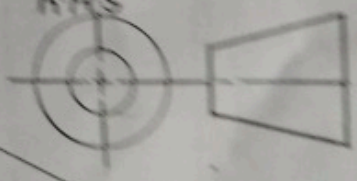
Q1B



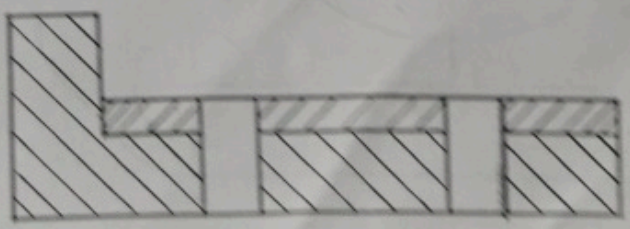
PLAN



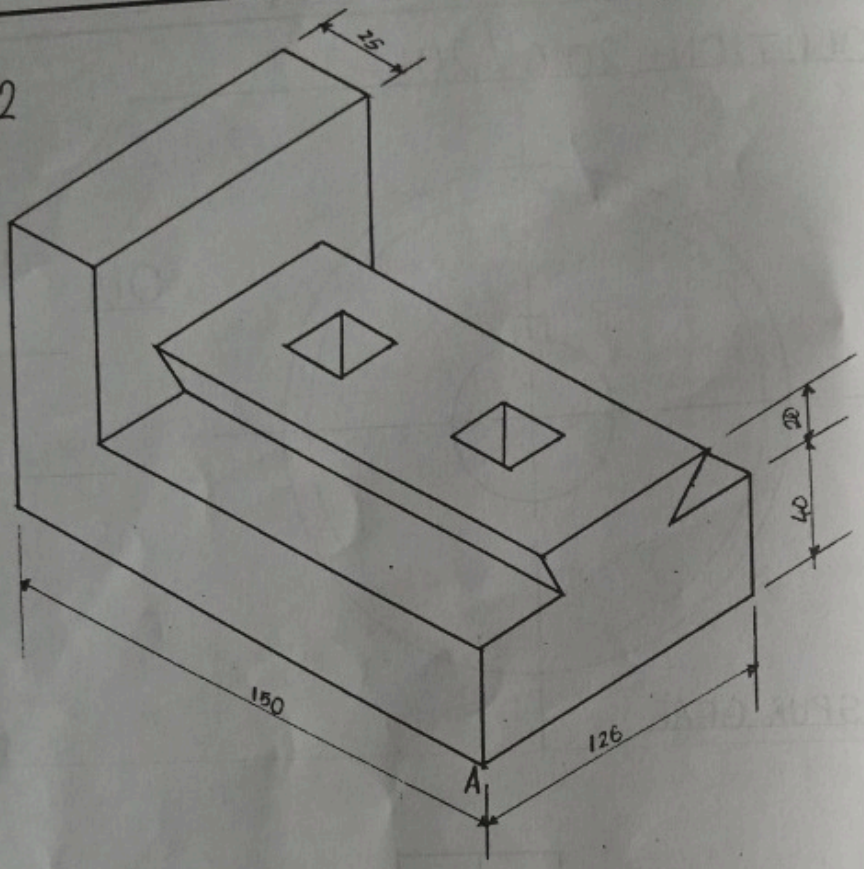
L.H.S FRONT ELEVATION R.H.S



Q4A

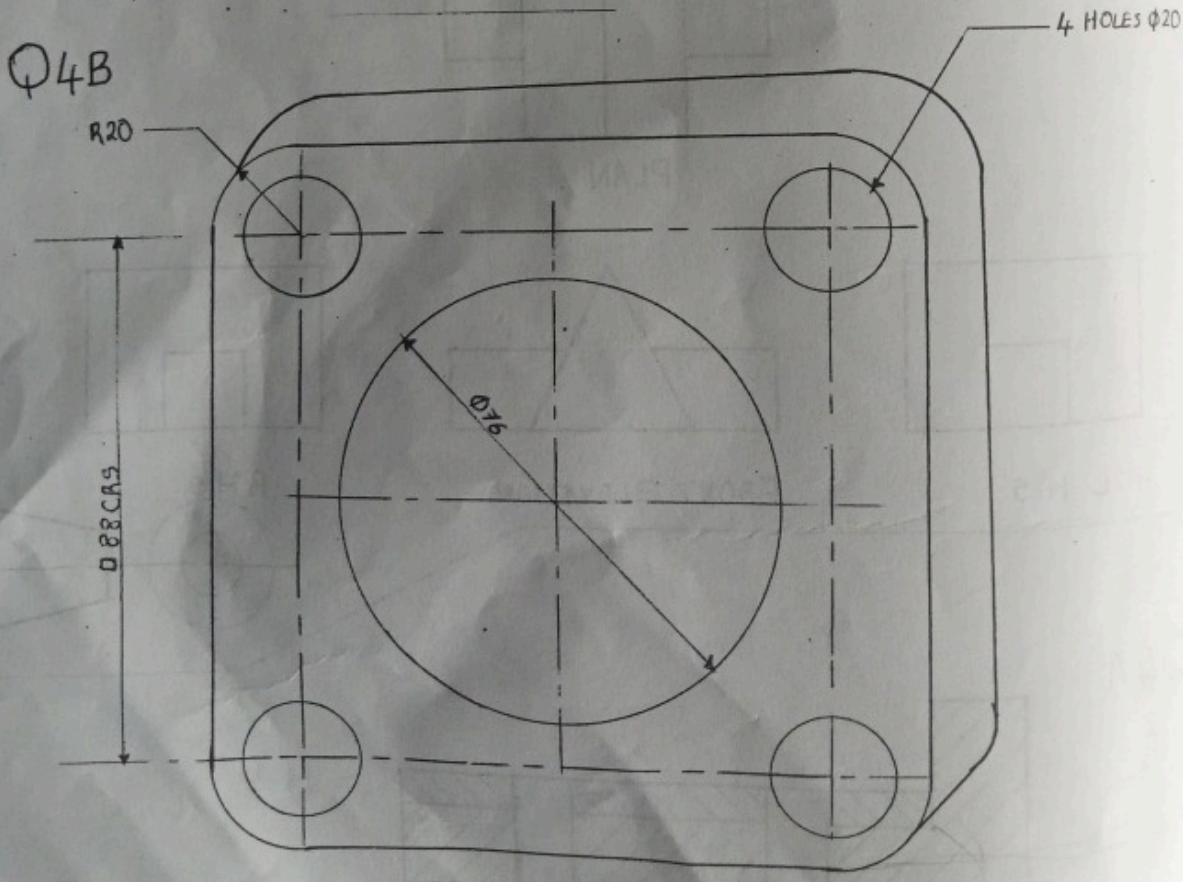


Q2



Q3 SAME AS 2013/2014 Q3B

Q4B



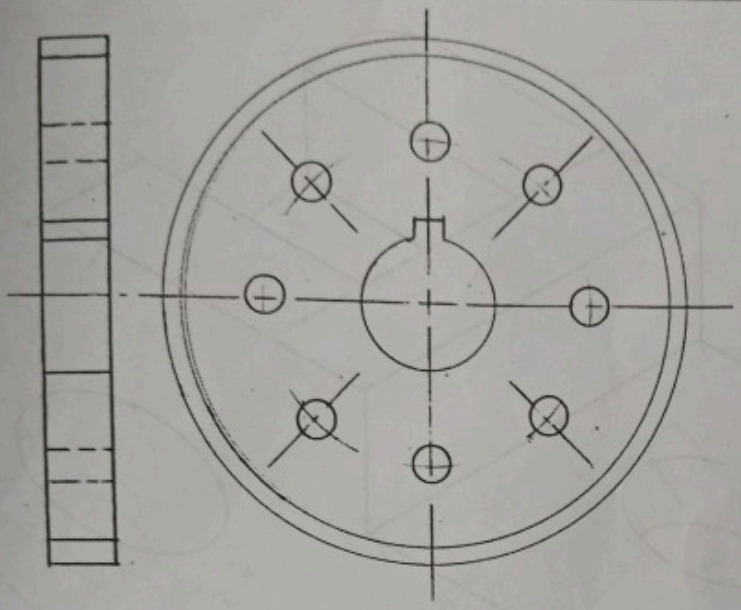
Q5 SAME AS 2010/2011 Q5

Q1A)

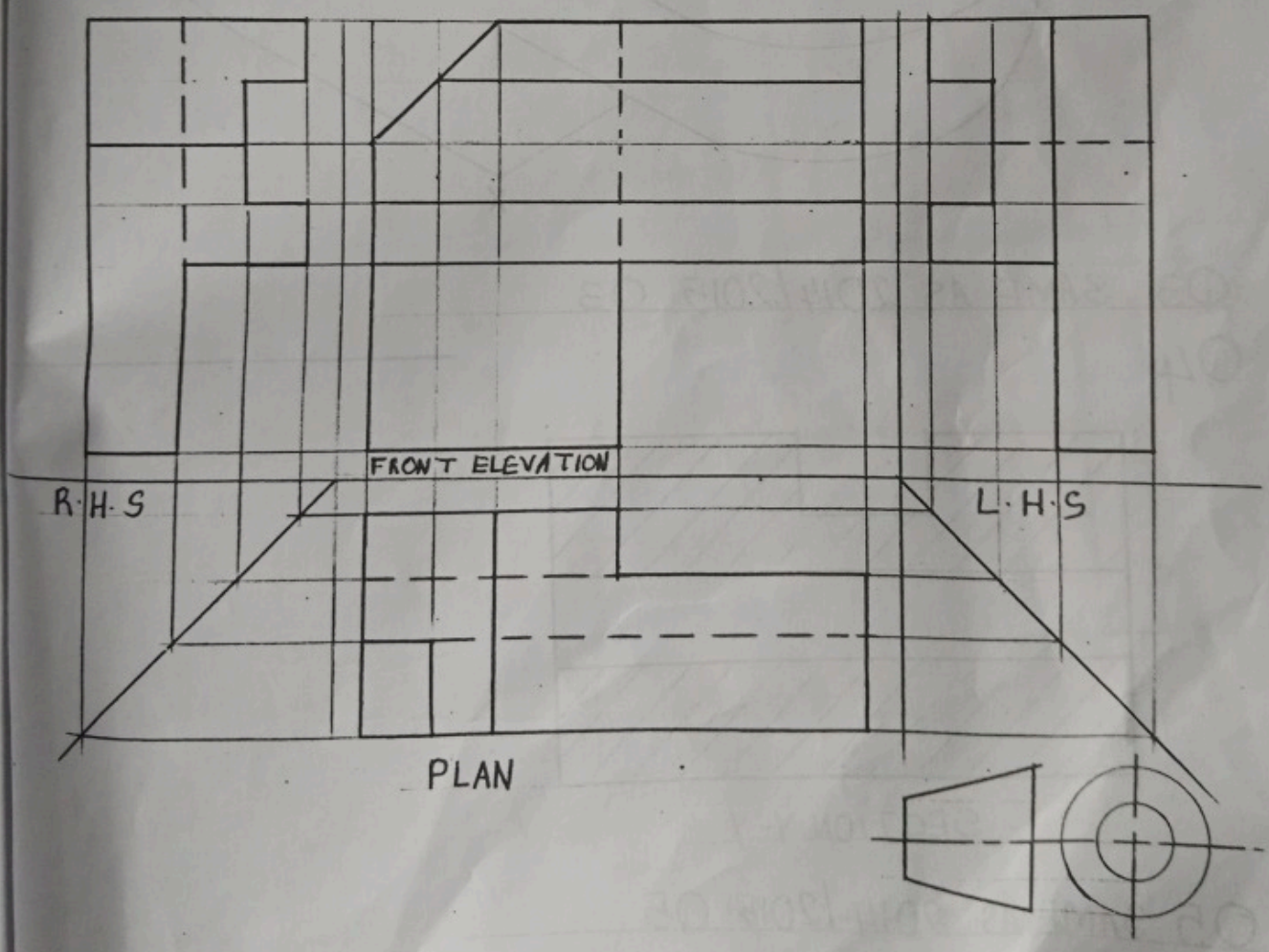
Q1B

SOLUTIONS TO 2017/2018

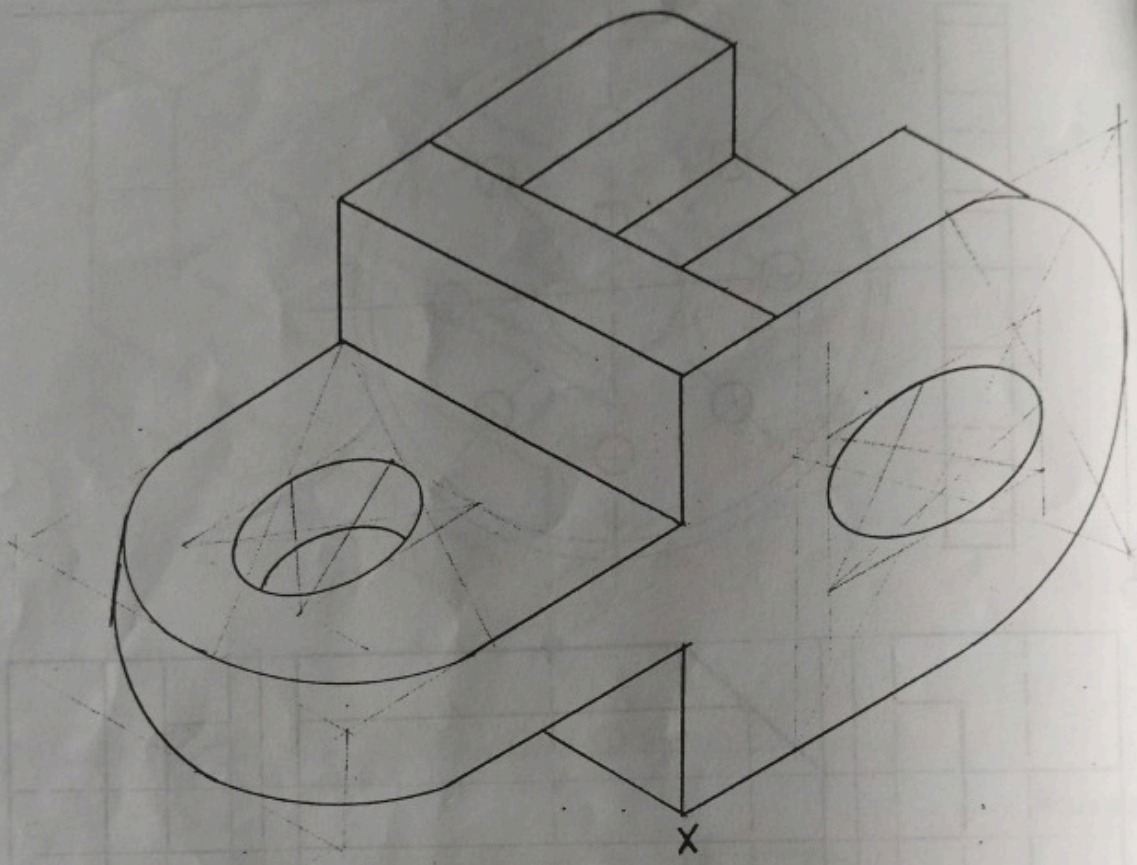
Q1A)



Q1B

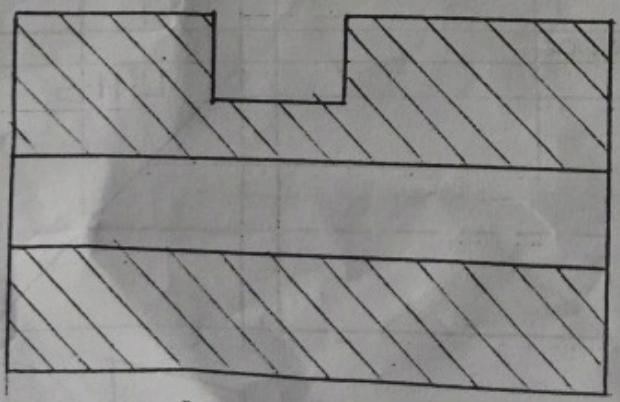


Q2



Q3 SAME AS 2014/2015 Q3

Q4



SECTION Y-Y

Q5 SAME AS 2014/2015 Q5

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING
2018/2019 RAIN SEMESTER EXAMINATION
COURSE: ENG 104 - ENGINEERING DRAWING 11. TIME: 3 HOURS. DATE: 13/11/2019

INSTRUCTIONS: (i) Answer question 1 and any other three questions (ii) Write your name (in full) and registration number with ink (iii) Submit the following assignments in your manual to your respective lecturers on/before 18/11/2019 [pg 4 no 4; pg 8 nos 2&3; pg 20 no 1&2]

1. a. Draw the conventional representation of a spur gear using your own dimensions.
   b. Using first angle orthographic projection, draw the front elevation, plan and the left hand side view of the object in Figure 1, viewed from direction A.

2. a. Copy the views in Figure 2 and draw the left hand side view.
   b. Make an isometric drawing of the views in Figure 2 such that point P is the lowest point on the drawing.

3 Using third angle projection, draw three views of an M 30 hexagonal bolt with a washer faced end, having a pitch of 4 mm and a nominal length of 120 mm. Show the thread end chamfered.

4. a. Copy the views in Figure 3 and draw section Y-Y
   b. Make an oblique drawing of the views in Figure 3.

5 The front elevation of a truncated cone, cut along planes B-B and D-D is shown in Figure 4. Copy the front elevation, draw the plan view, and draw the development of the surface.

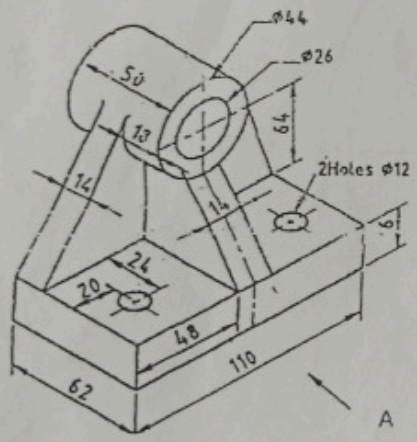


Figure 1

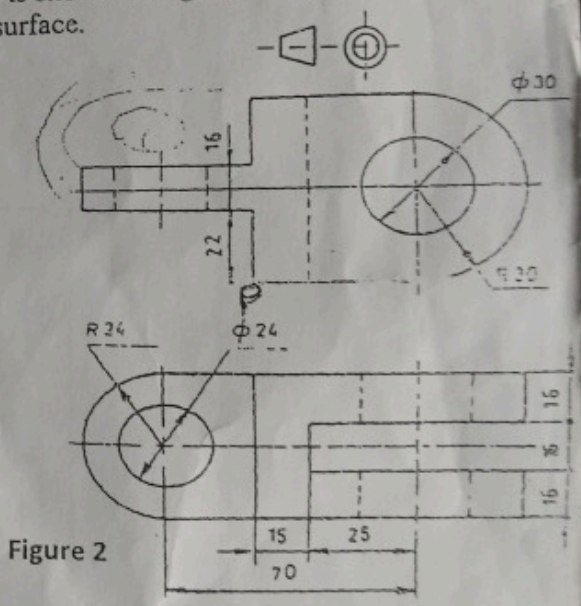


Figure 2

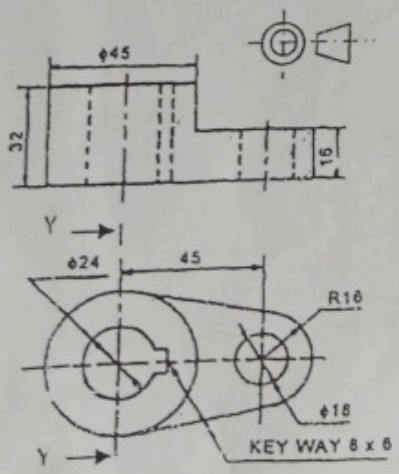


Figure 3

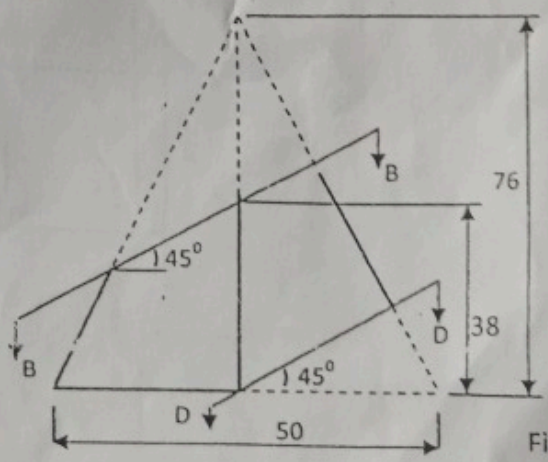
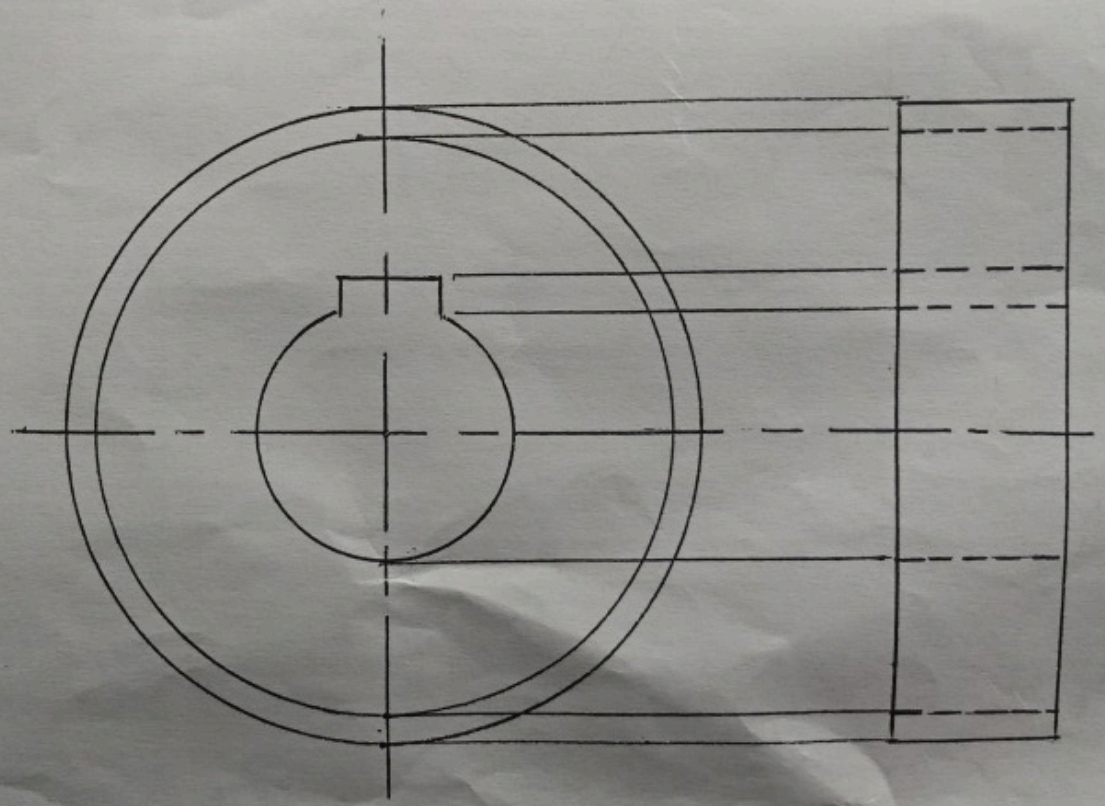


Figure 4

All dimensions are in millimeters



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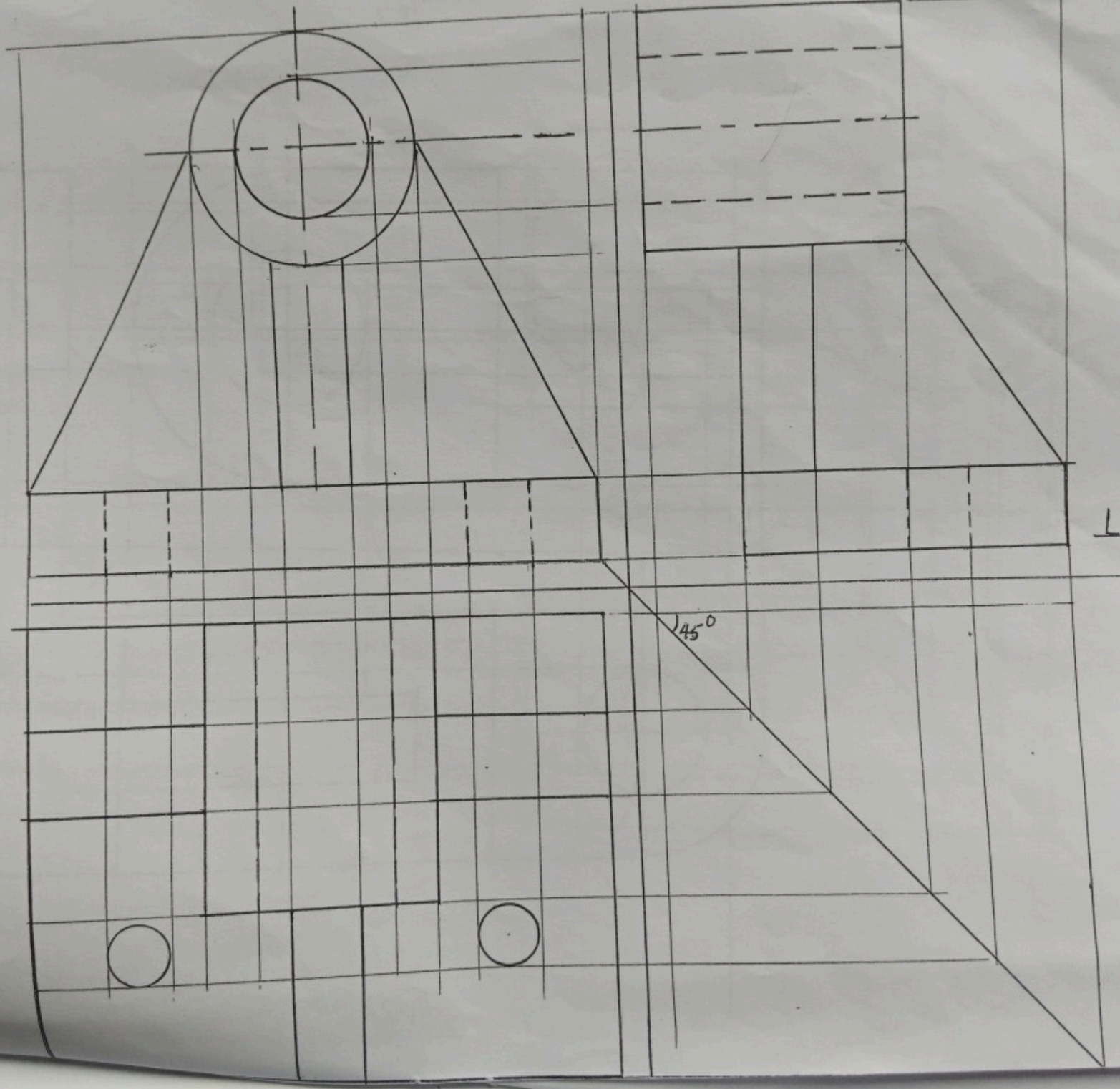
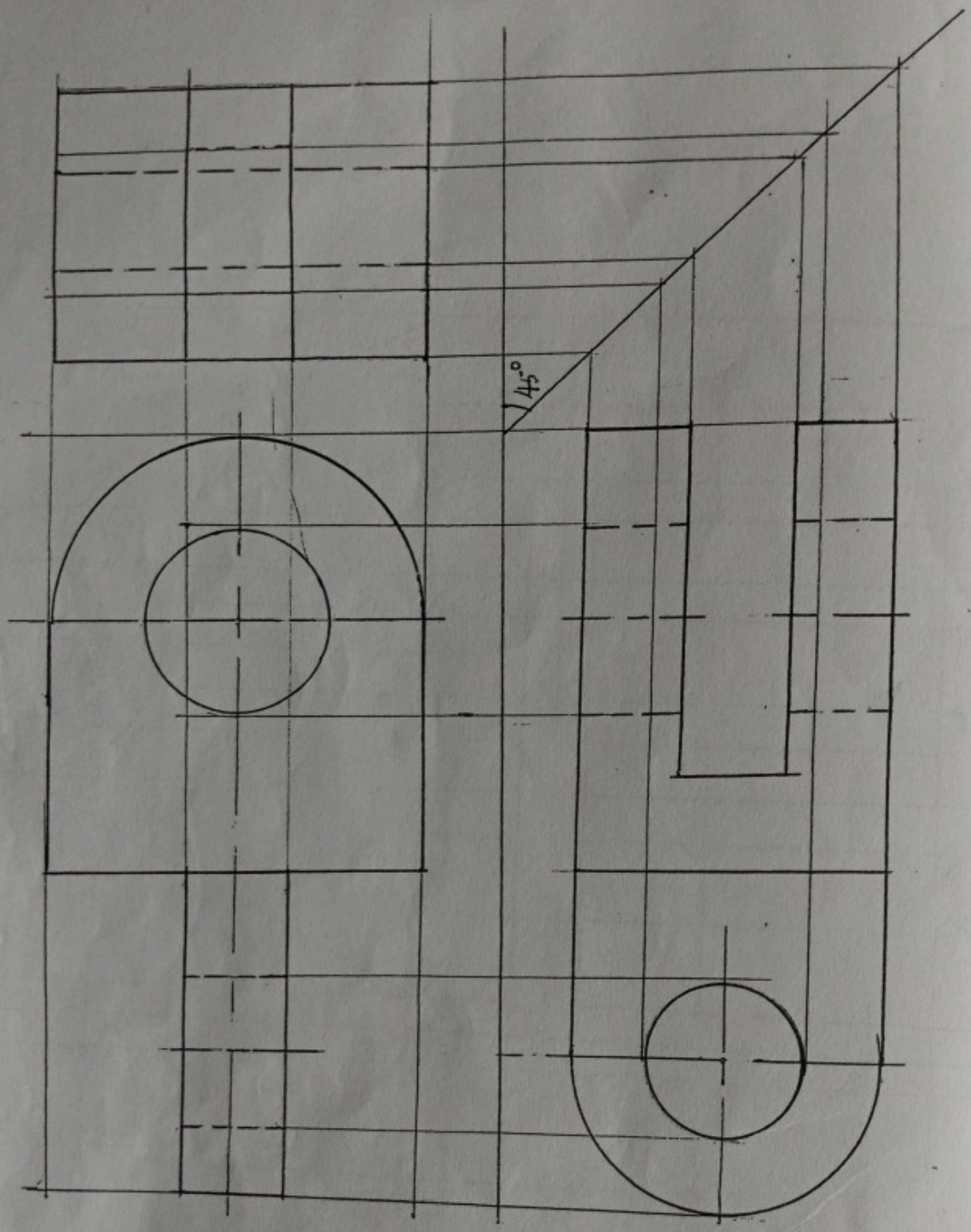
REVOLUTION CONVENTION OF A SPUR GEAR

Q4A

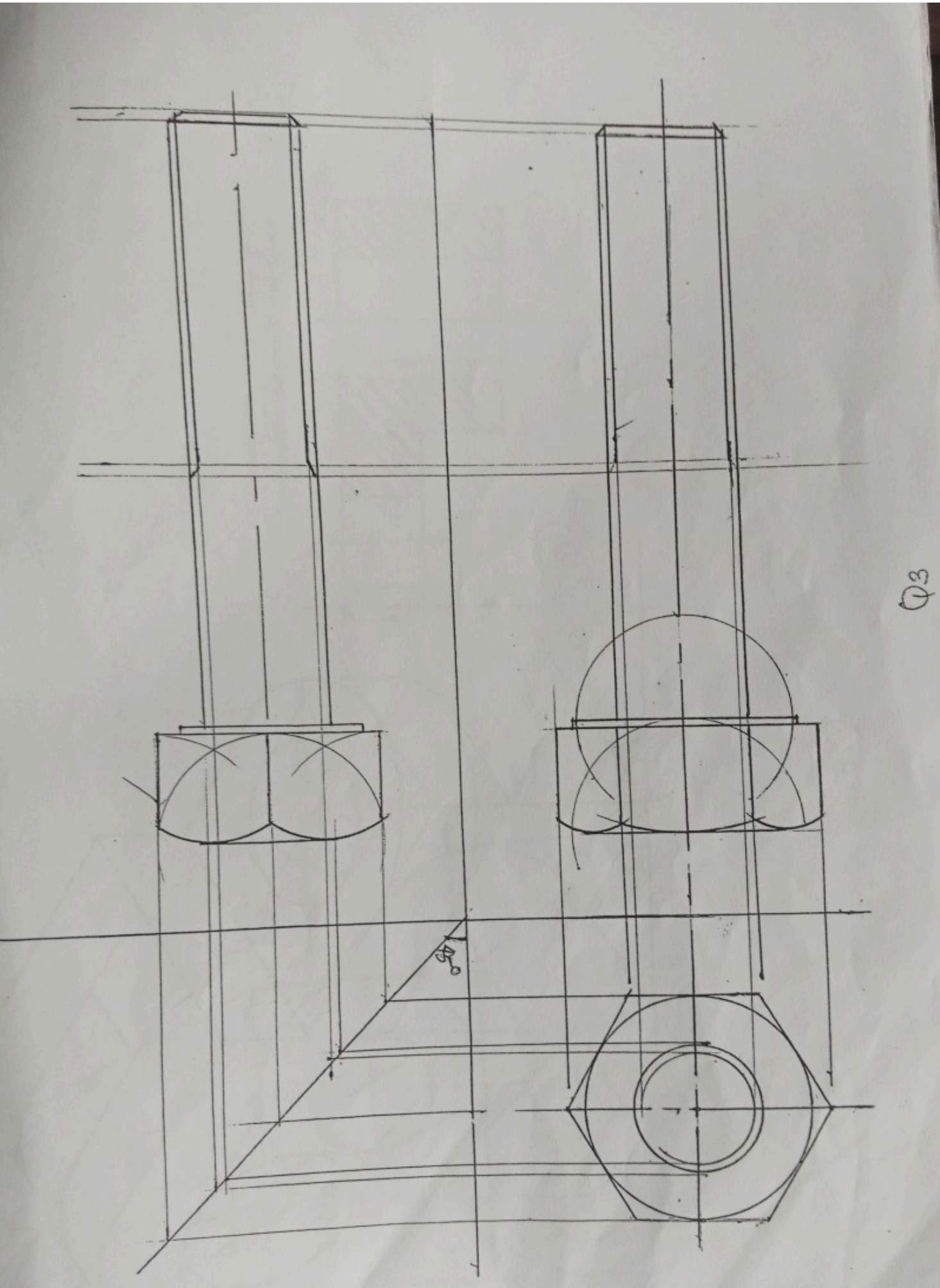
Q18



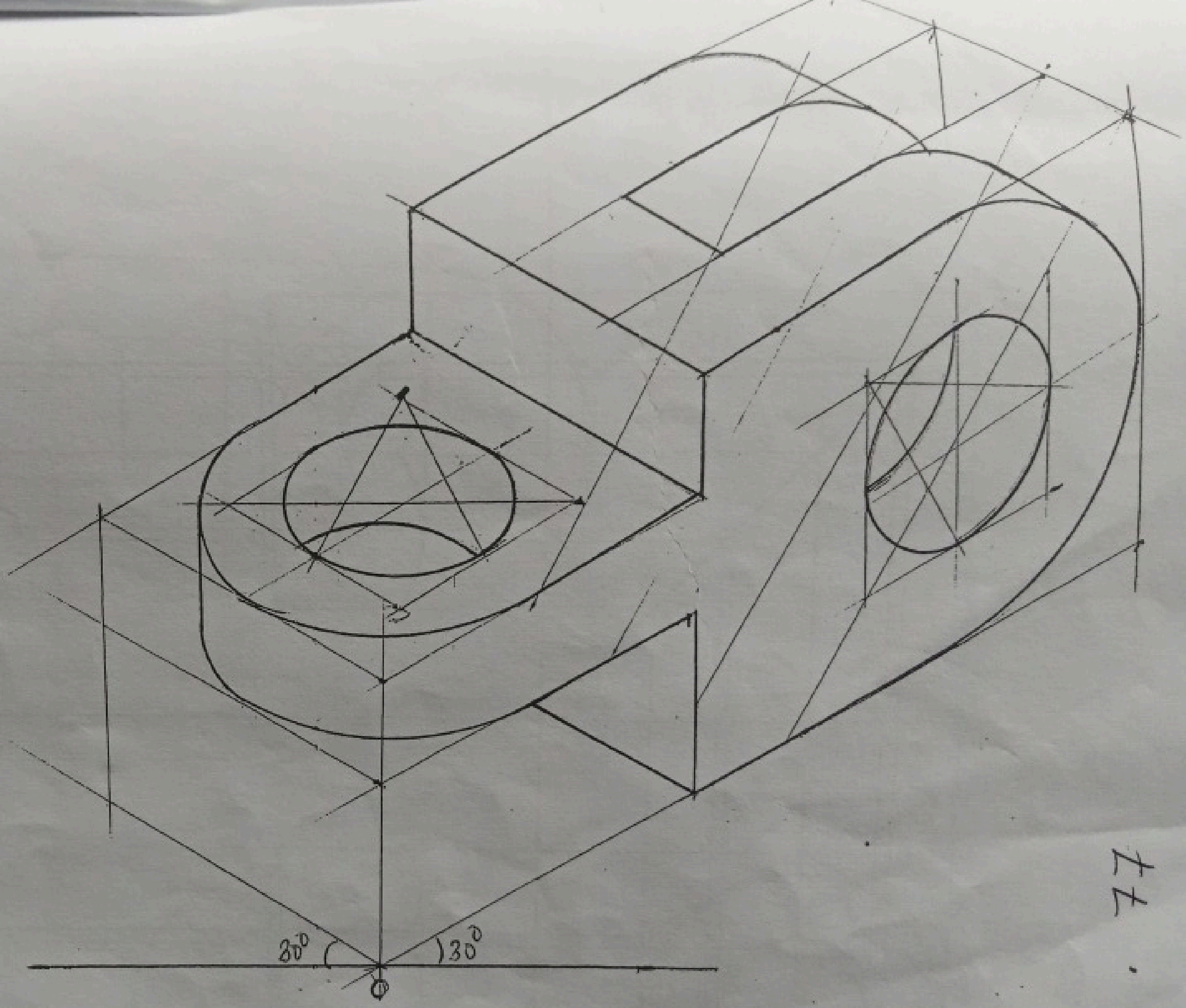
75



A2



Q3



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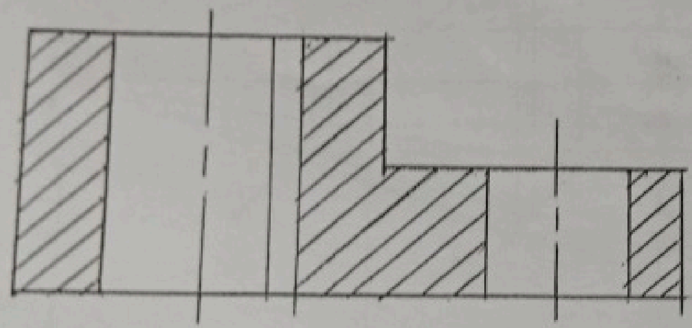
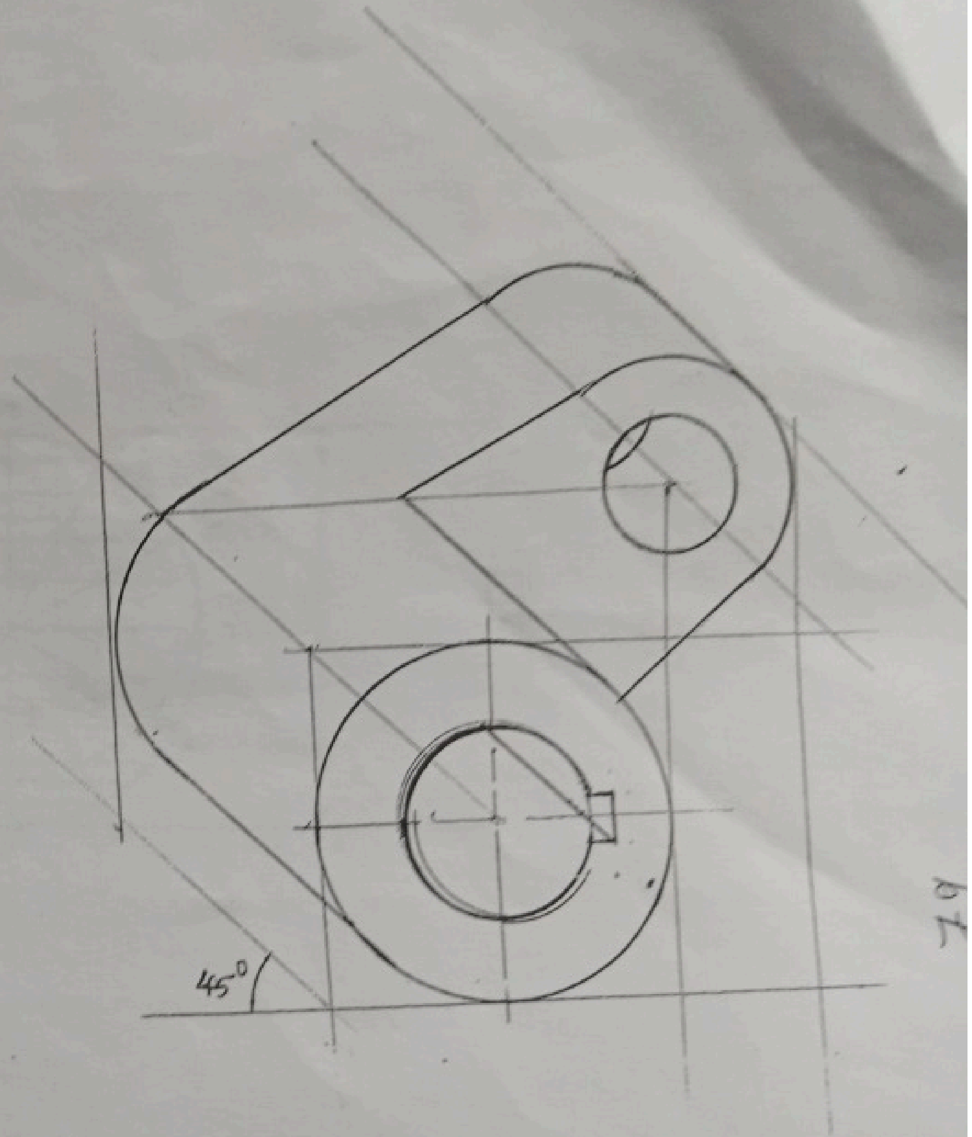


SECTION Y–Y



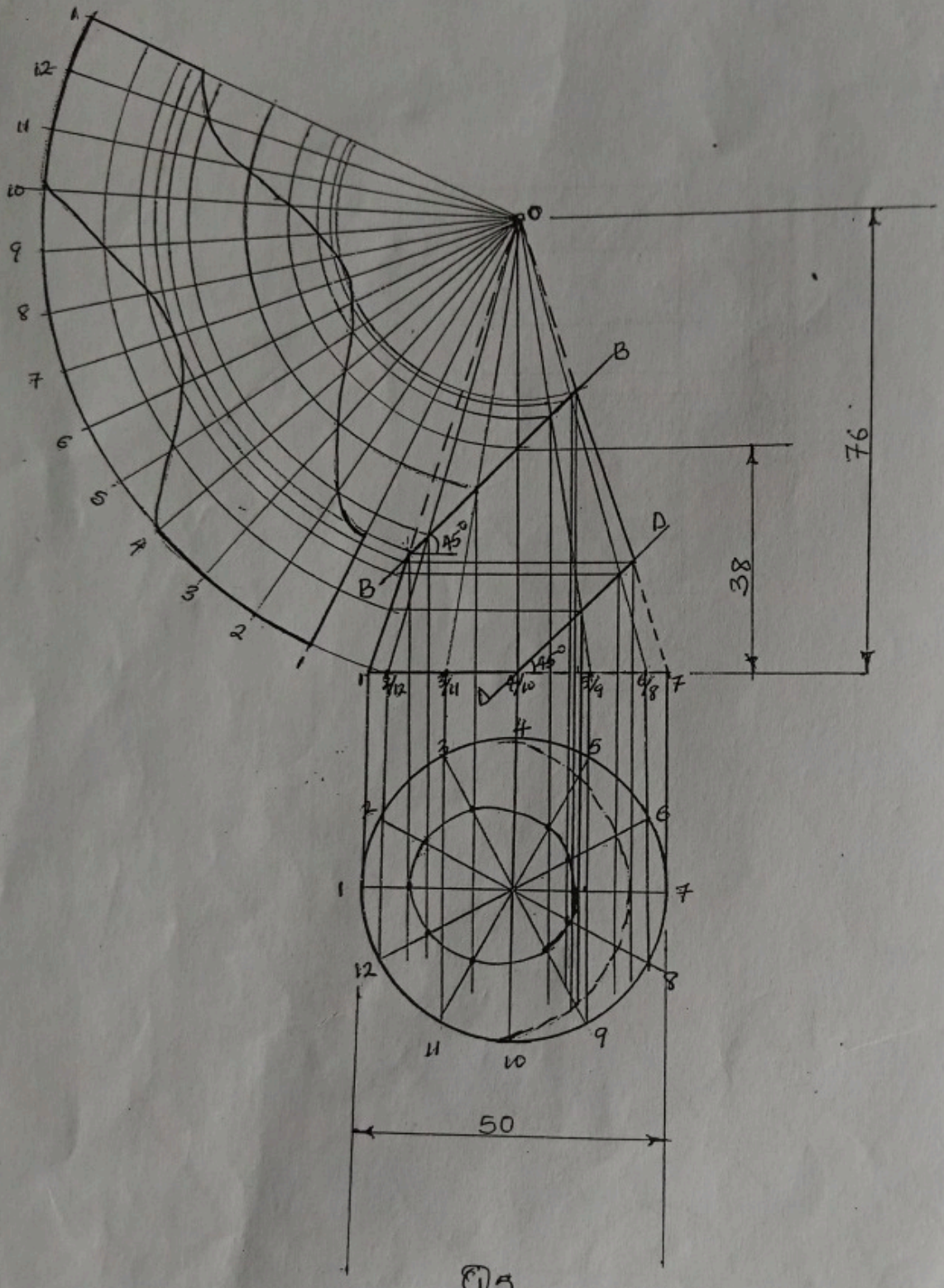


Fig 5

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
STUDENTS' UNION GOVERNMENT
STUDENTS' REPRESENTATIVE COUNCIL

"Women are Leaders everywhere."
as women, we must stand up for ourselves,
we must stand up for each other
for justice for all

RT.HON.RTR.
OBI ONYINYECHI FAVOUR
SPEAKER SUG FUTO