ENGINEERING DRAWING

DR. AHMED NEGM

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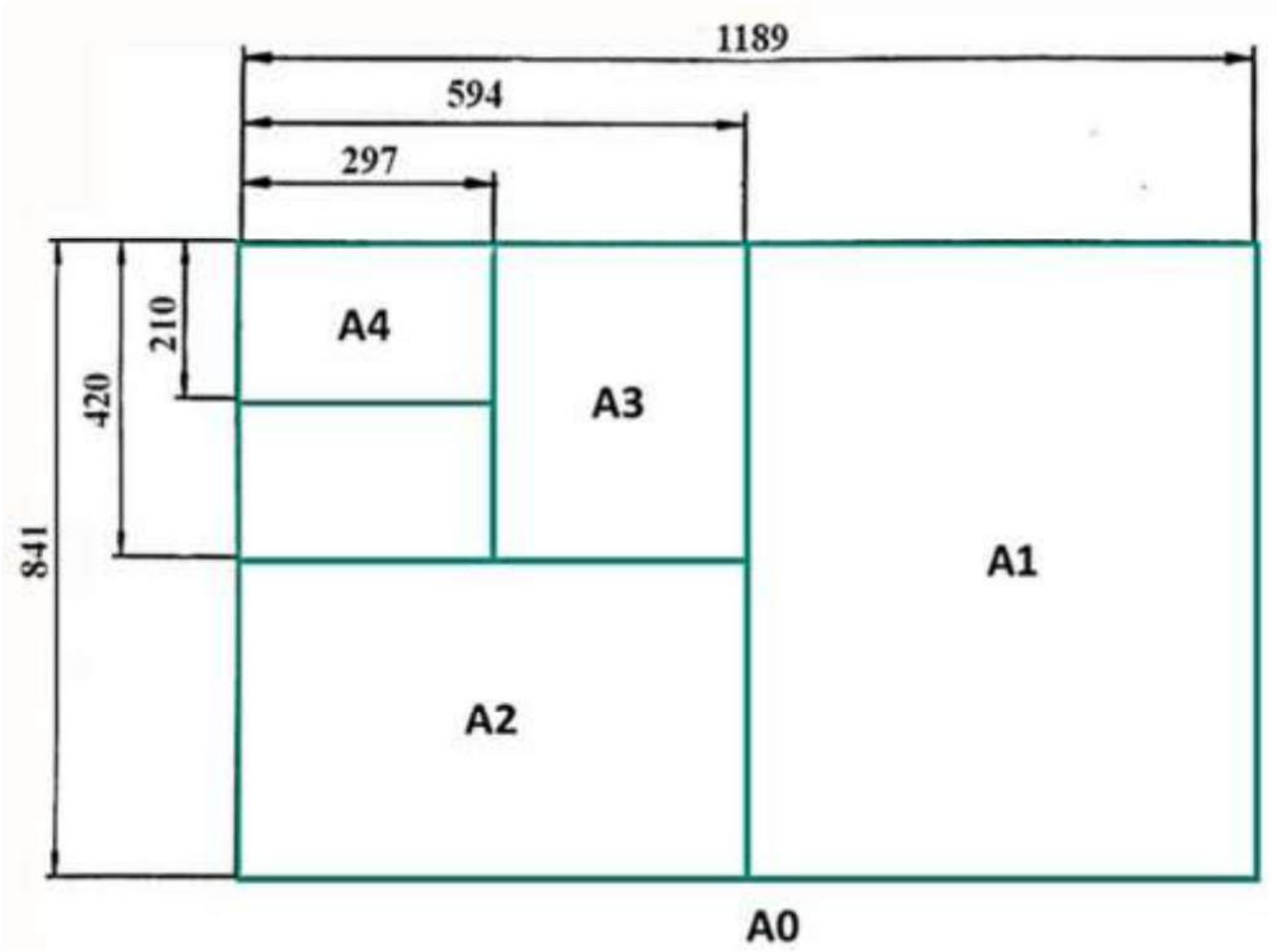
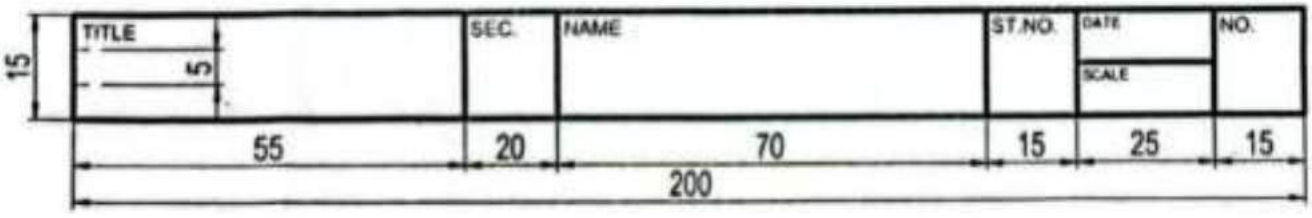
CHAPTER 1 : ALPHABET OF LINES AND LETTERING

1.1.STANDARD DRAWING SHEET FORMATS

(ALL DIMENSINS ARE IN MM)

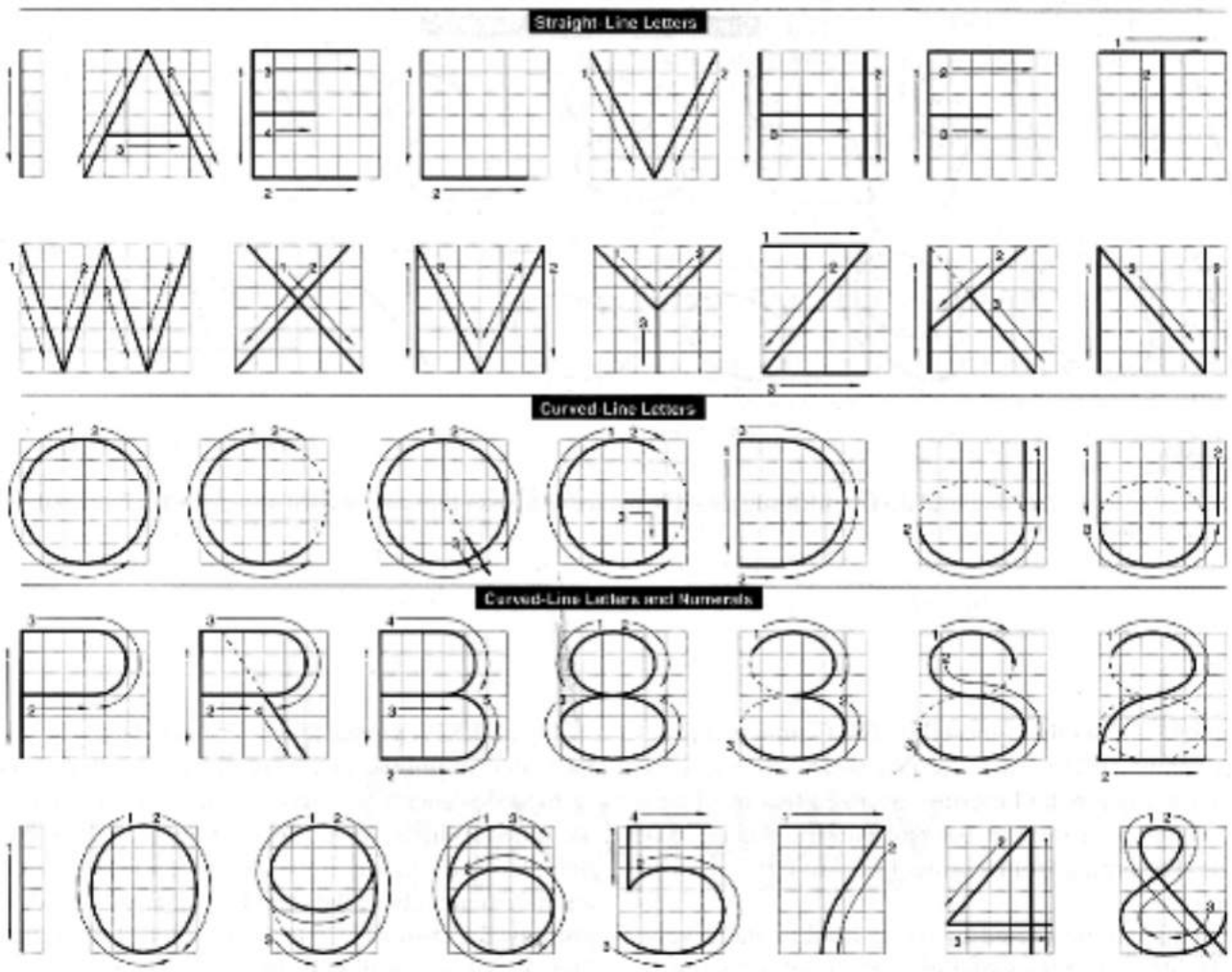


1.2.TYPICAL TABLE DIMENSIONS TO BE USED IN THE DRAWING SHEET:



1.3.STANDARD ENGINEERING DRAWING SHEET SIZES (ISO A SERIES)

Sheet Size	Dimensions (mm)	Typical Use in Engineering Drawing
A0	841 × 1189	Very large assemblies, project layouts
A1	594 × 841	Large technical drawings, complete machines
A2	420 × 594	Sub-assemblies, detailed drawings
A3	297 × 420	Machine components, medium details
A4	210 × 297	Small parts, detail drawings, documentation



1.4.LETTERING PRACTICE

a) For the following letters and numbers, practice single stroke letters writing with equal spacing.

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

W

X

Y

Z

1

2

3

4

5

6

7

8

9

0

TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

b) Rewrite the following sentences in different sizes using single stroke letters writing method with an equal spacing.

WHILE IT IS TRUE THAT

" PRACTICE MAKES PERFECT ," IT MUST BE

UNDERSTOOD THAT PRACTICE IS NOT ENOUGH, IT MUST

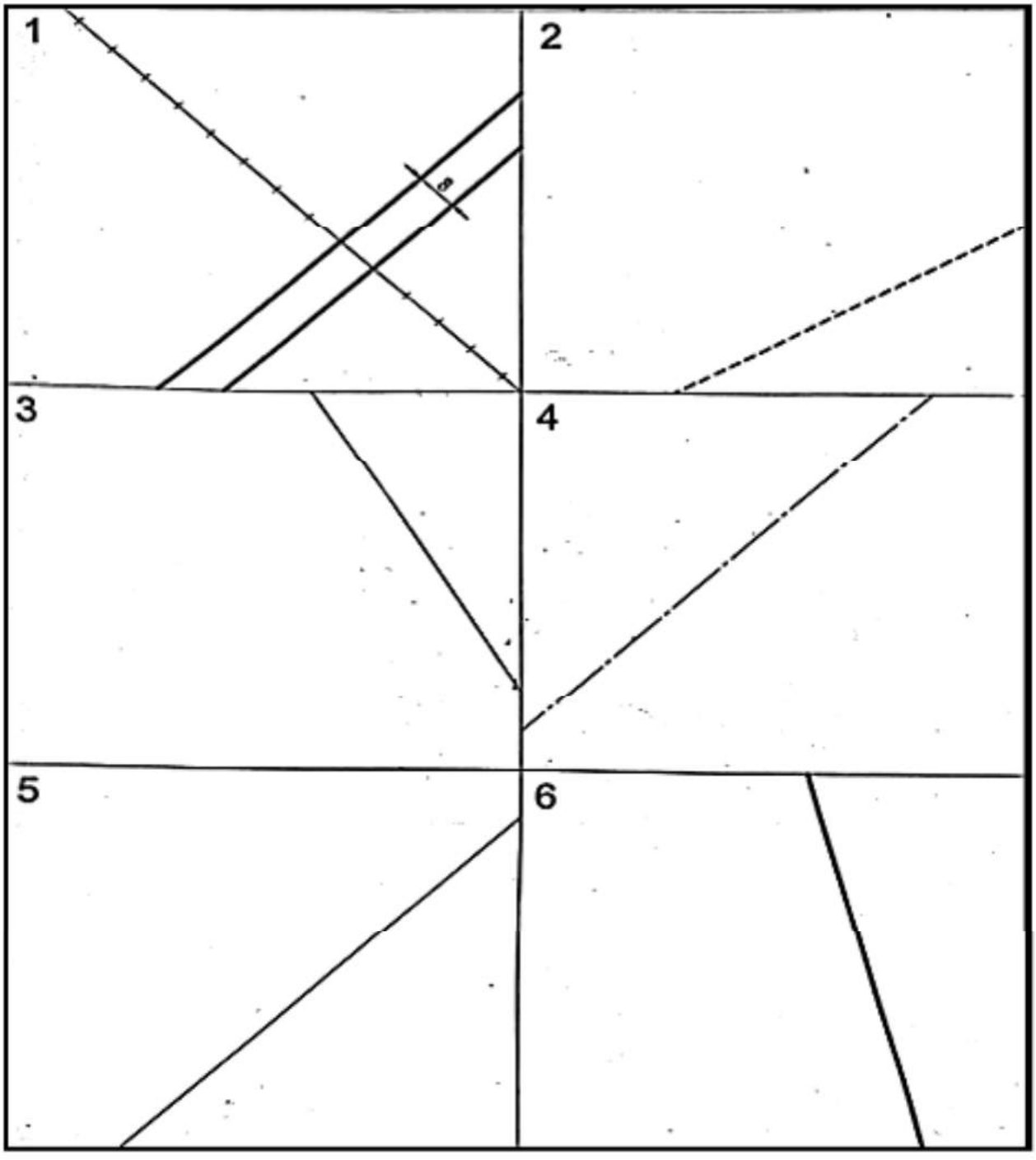
BE ACCOMPANIED BY A CONTINUOUS EFFORT TO IMPROVE SKILLS.

EXCELENT LETTERERS ARE OFTEN NOT GOOD WRITERS. ALWAYS SHARPENED PENCIL CAN DO GREAT JOB.

TITLE	SEC.	NAME	ST.NO.	DATE / SCALE	NO.

1.5.ALPHABET OF LINES PRACTICE

a) Fill each square from 1 to 6 by drawing equidistance lines with 8 mm apart according to the given type of line and inclination in each square

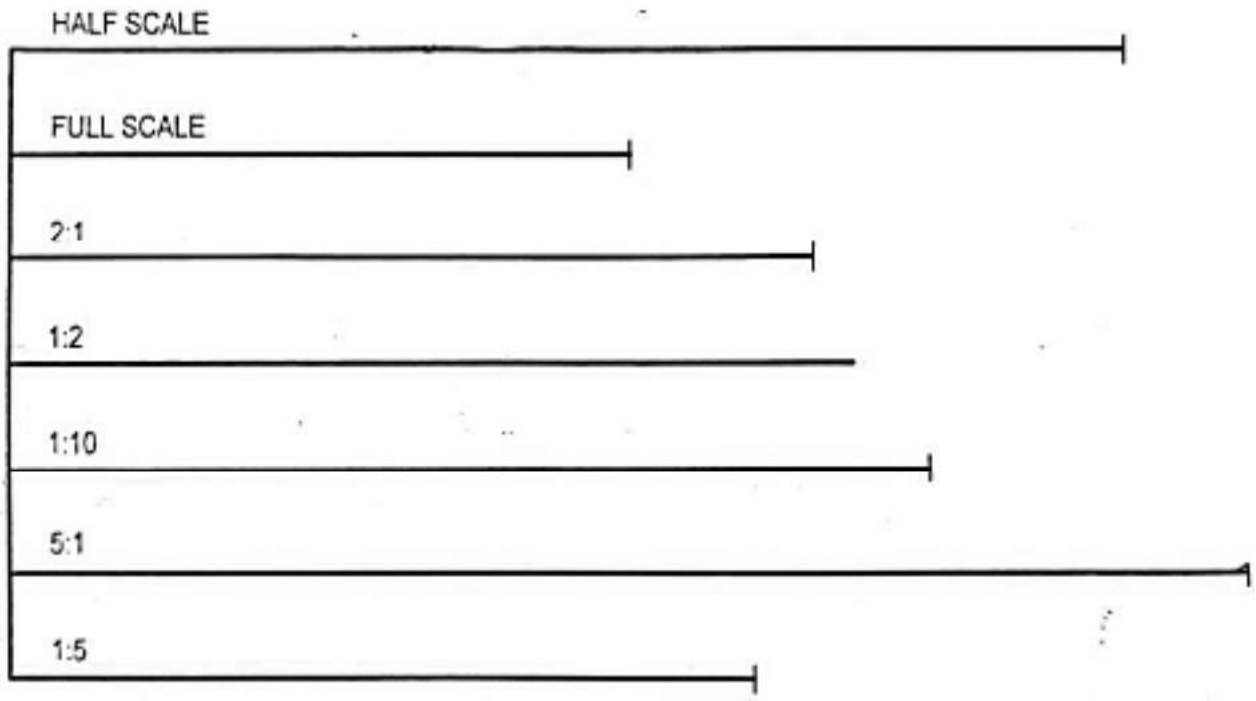


TITLE	SEC.	NAME	ST.NO.	DATE / SCALE	NO.

b) Draw solid lines according to the measurements and scales indicated below

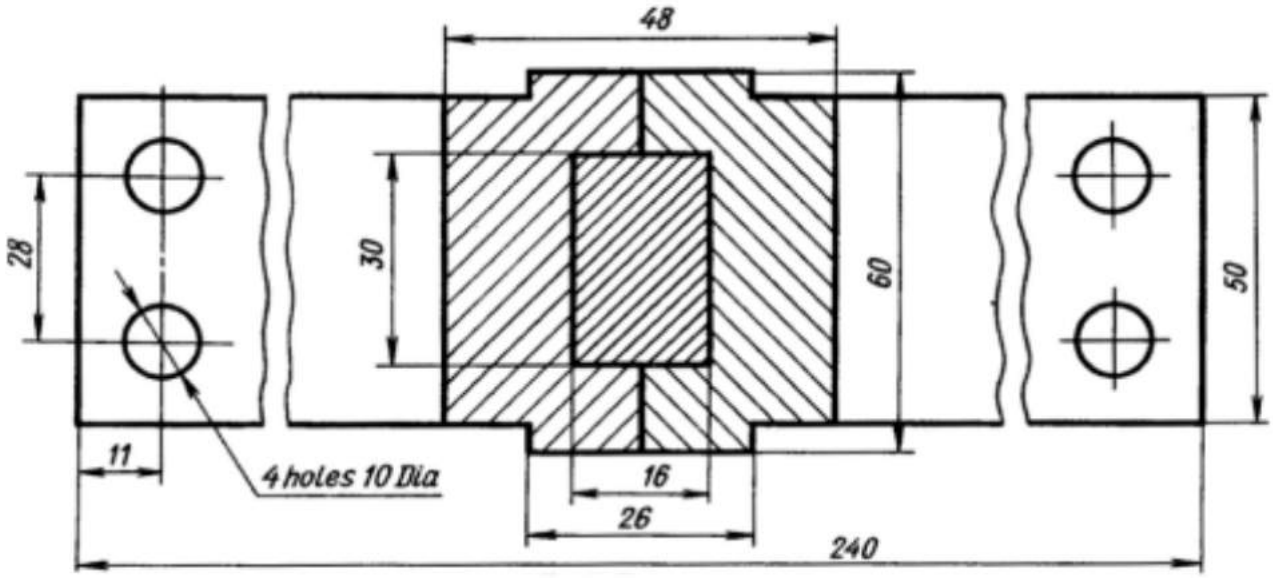
SCALE: 1:2 (LENGTH 107.9 mm)
SCALE: 2:1 (LENGTH 35.7 mm)
SCALE: 5:1 (LENGTH 23 mm)
SCALE: 1:10 (LENGTH 795.5 mm)
SCALE: 1:100 (LENGTH 8521 mm)
SCALE: 1:5 (LENGTH 542.2 mm)
FULL SCALE (LENGTH 76 mm)

c) Measure each of the following lines according to the indicated scale, then write the length in [mm]



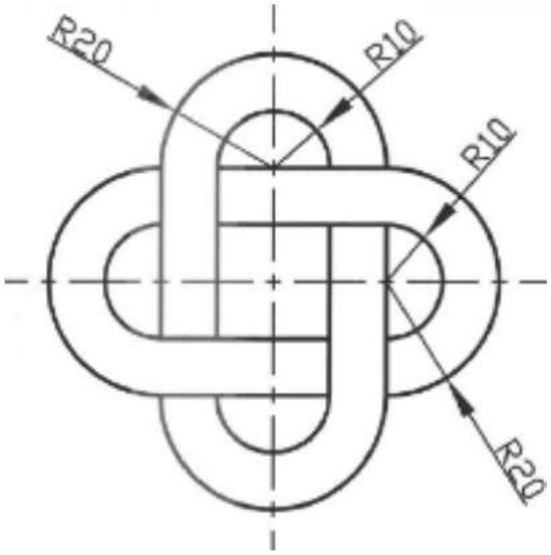
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

d) Redraw the following shapes keeping to the standard line thickness (do not dimension the drawing)



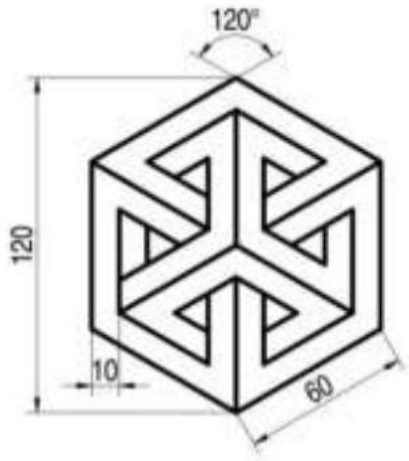
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

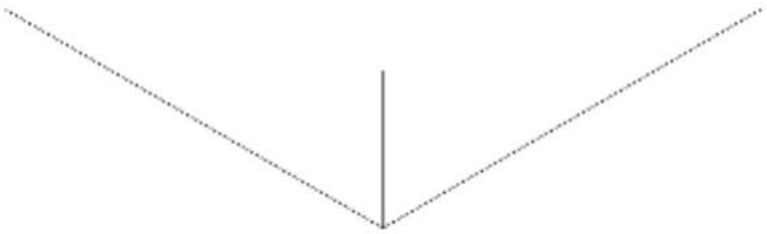
e) Redraw the following shapes keeping to the standard line thickness (do not dimension the drawing)



TITLE	SEC.	NAME	ST.NO.	DATE SCALE	NO.

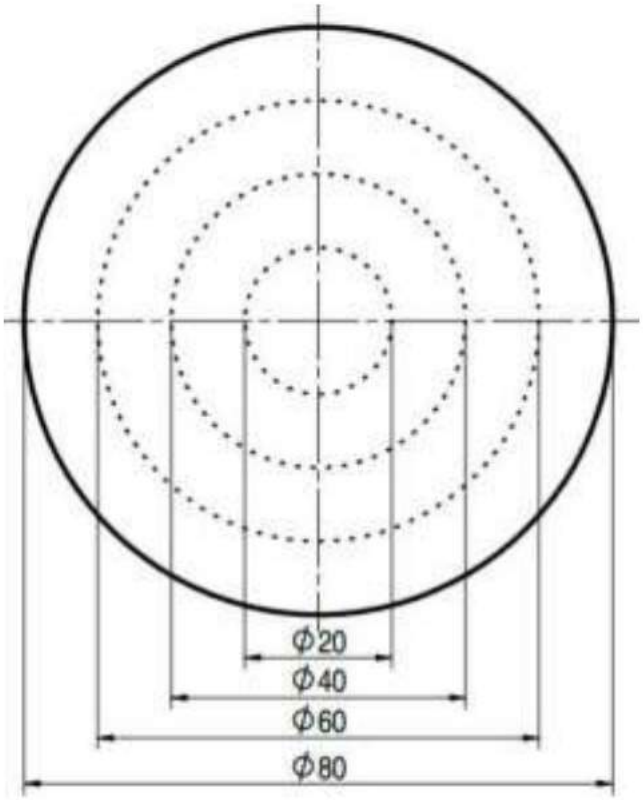
f) Redraw the following shapes keeping to the standard line thickness (do not dimension the drawing)

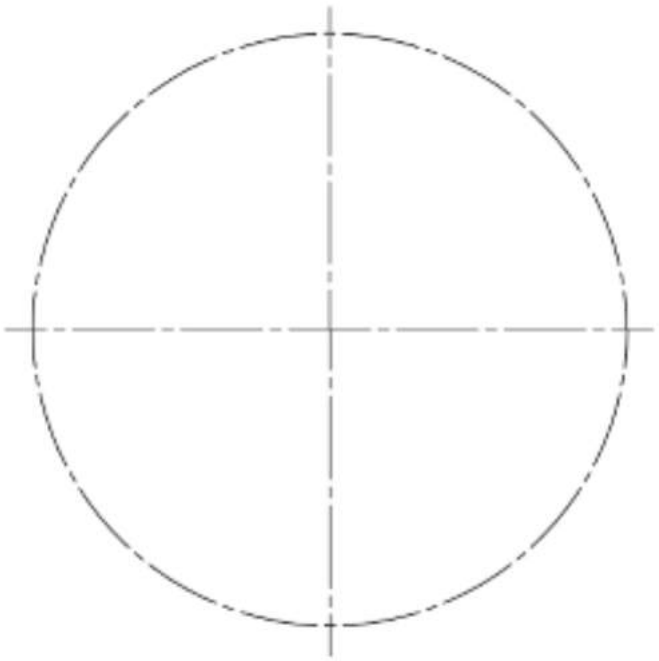


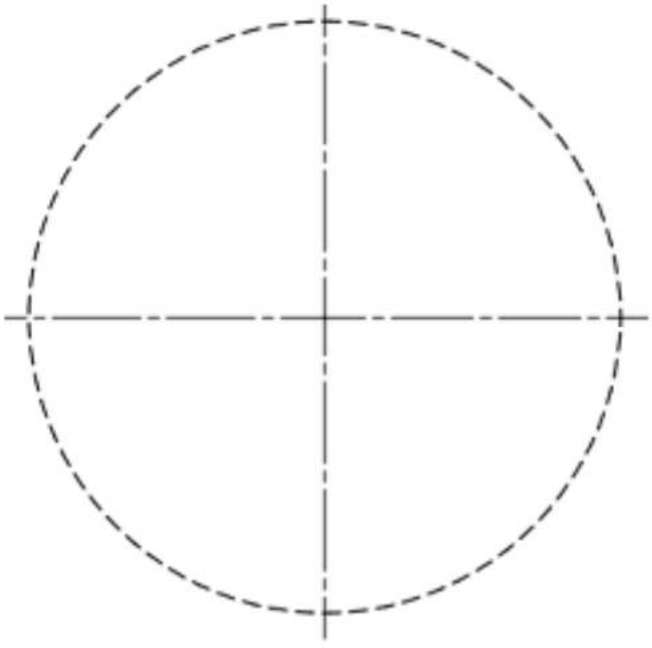


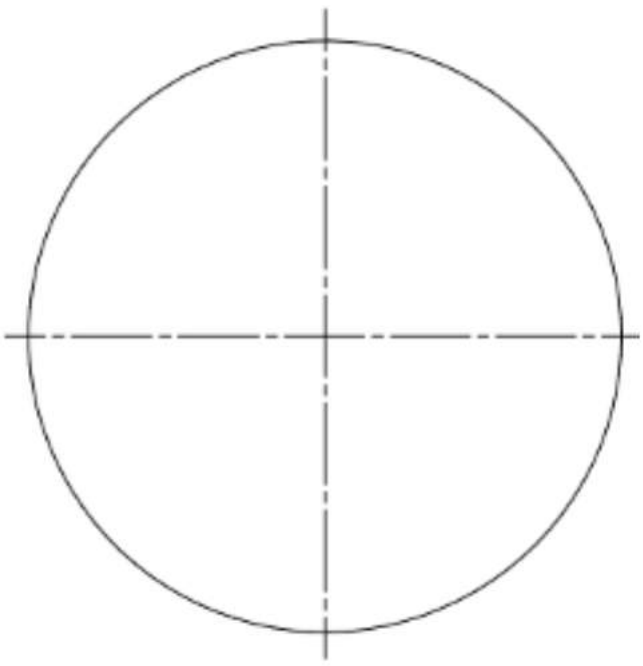
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

g) Draw circles parallel to the circle given with equidistance of 10 mm, take in consideration the kind of line shown in each figure









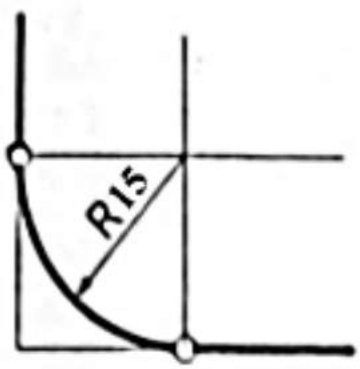
TITLE	SEC.	NAME	ST.NO.	DATE / SCALE	NO.

CHAPTER 2 GEOMETRIC CONSTRUCTIONS

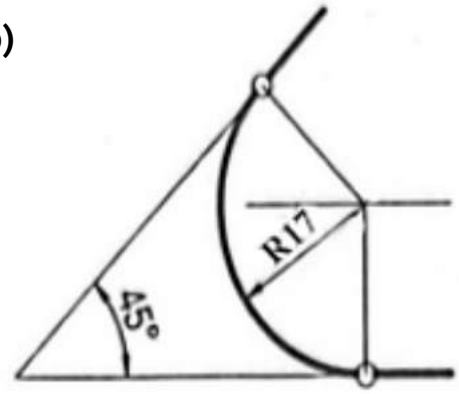
2.1.CURVE AND LINE TANGENCY PRACTICE

a) Make a full-size drawing for the following figures. Locate and mark all centers and tangency points. Don't erase construction lines. "Don't dimension your drawings".

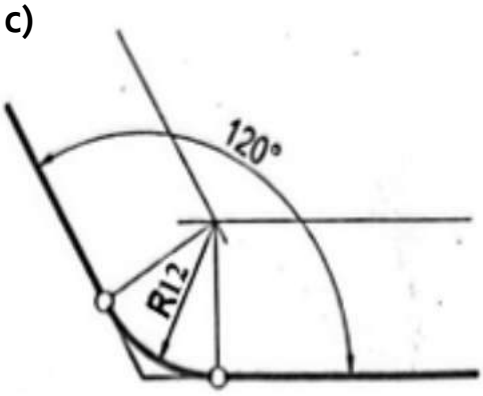
a)



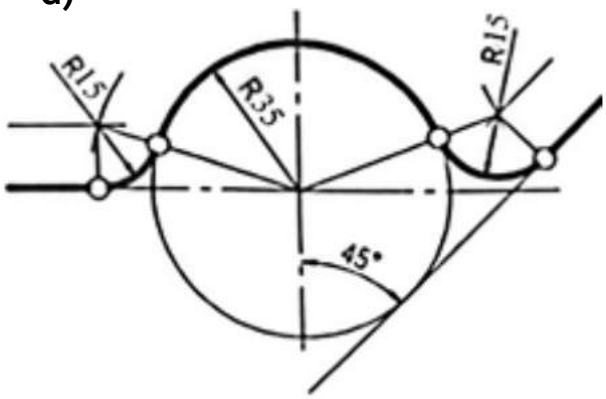
b)



c)



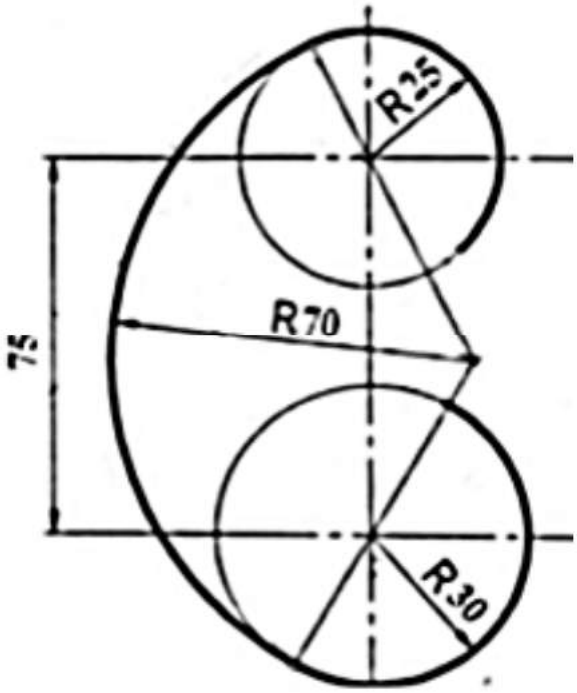
d)



2.2.CURVE BETWEEN TWO CIRCLES TANGENCY PRACTICE

a) Make a full-size drawing for the following figures. Locate and mark all centers and tangency points. Don't erase construction lines. "Don't dimension your drawings".

1



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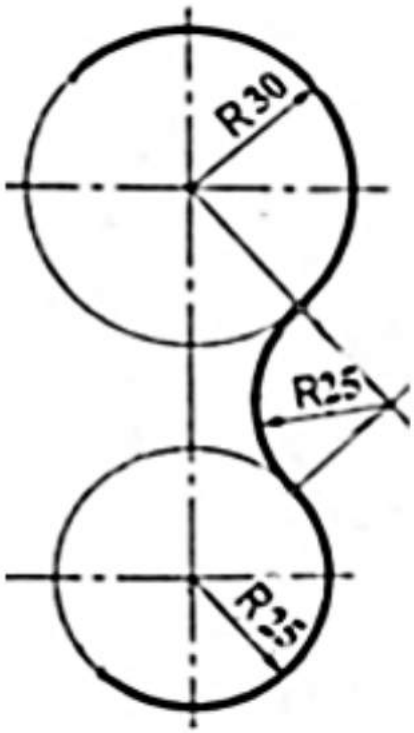
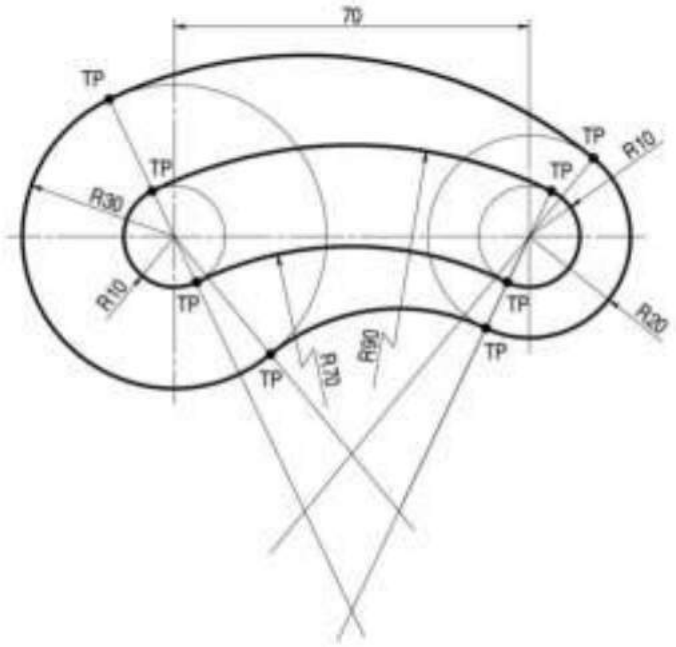
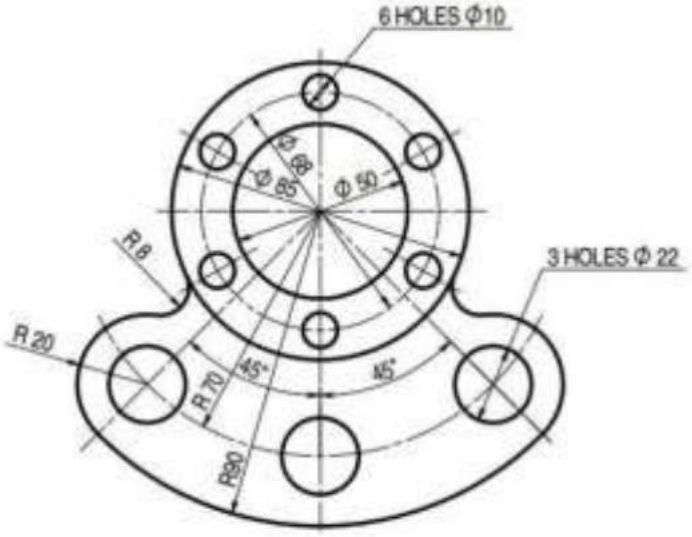


b) Redraw the figure shown below.



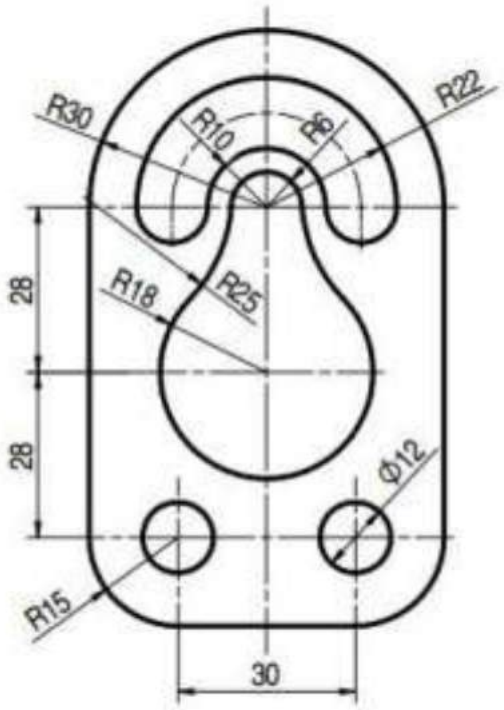
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

c) Redraw the figure shown below.



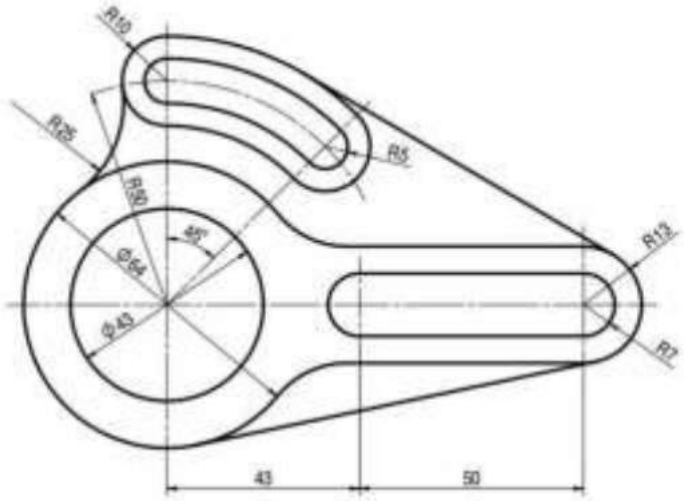
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

d) Redraw the figure shown below.



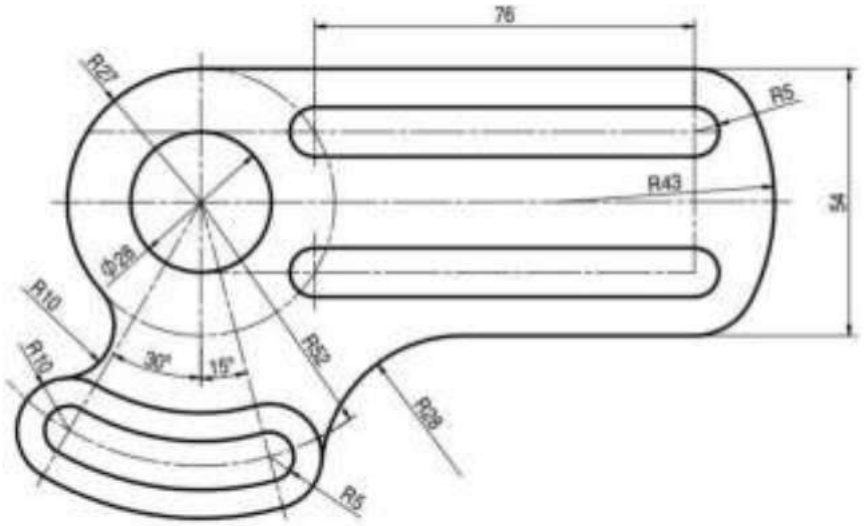
TITLE	SEC.	NAME	ST.NO.	DATE / SCALE	NO.

e) Redraw the figure shown below.



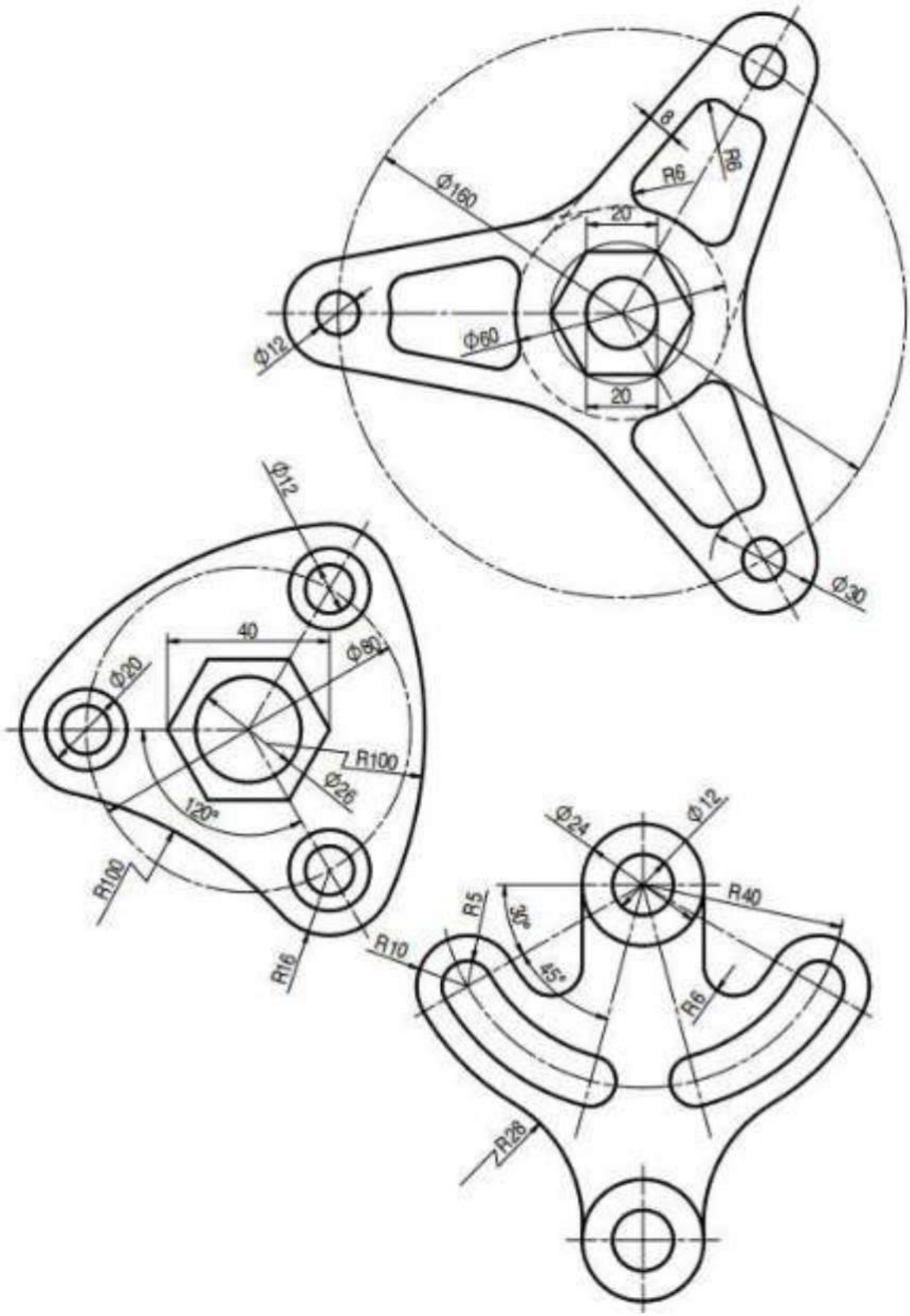
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

f) Redraw the figure shown below.



TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

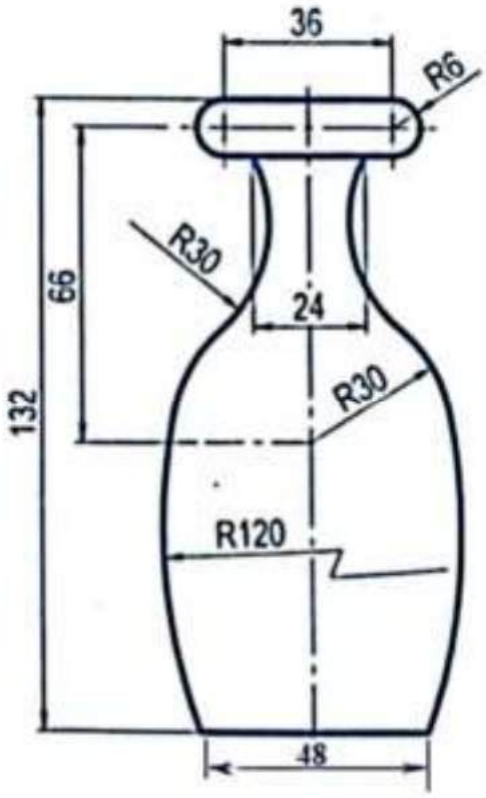
g) Redraw the figures shown below, using a suitable paper size.



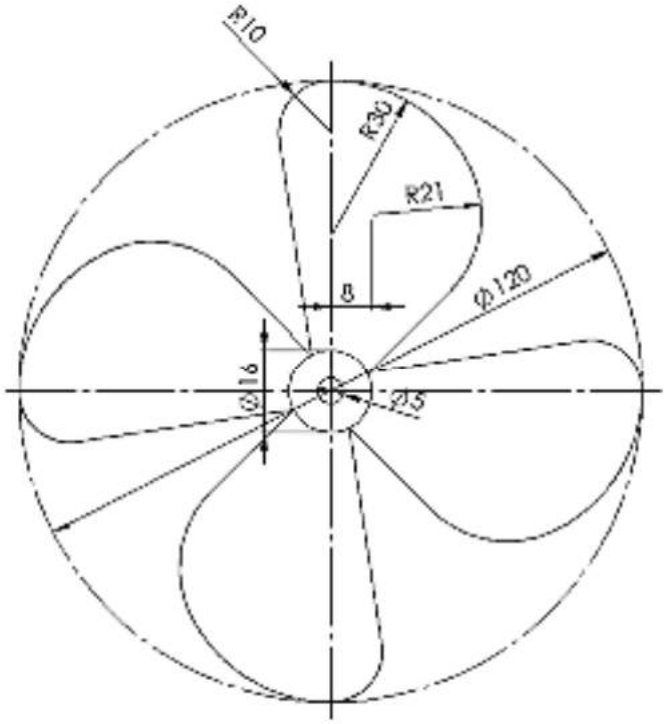
2.3.TANGENCY PRACTICE

a) Make a full-size drawing for the following figures. Locate and mark all centers and tangency points. Don't erase construction lines. "Don't dimension your drawings".

1



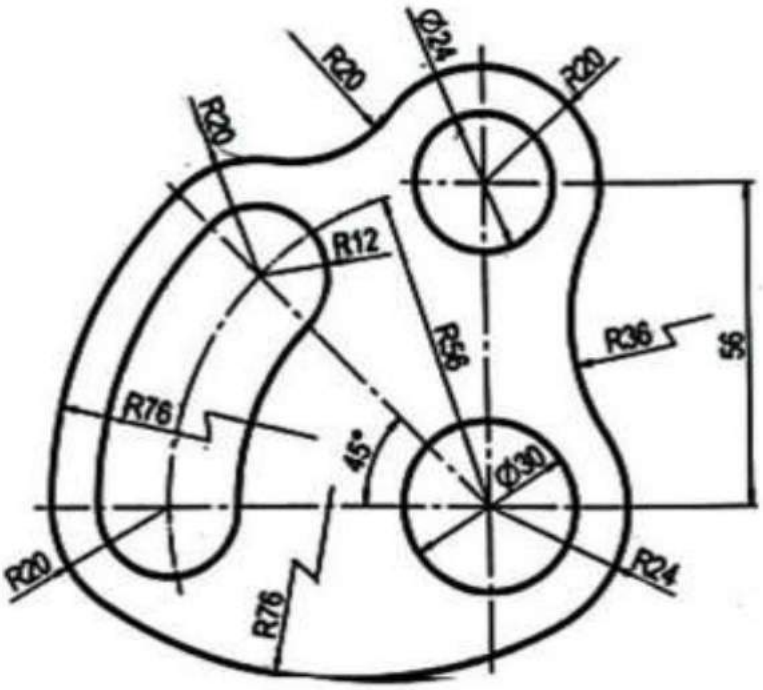
2



b) Make a full-size drawing for the following figures. Locate and mark all centers and tangency points. Don't erase construction lines. "Don't dimension your drawings".

1

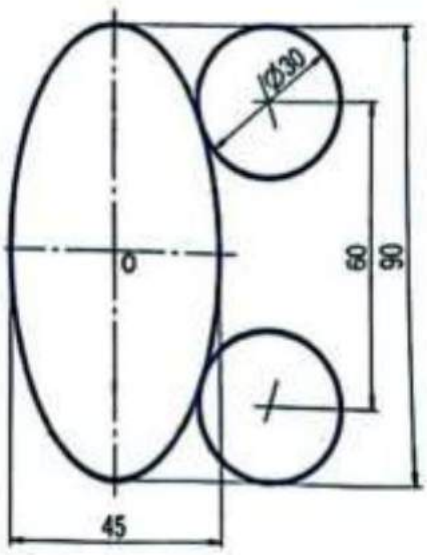
2



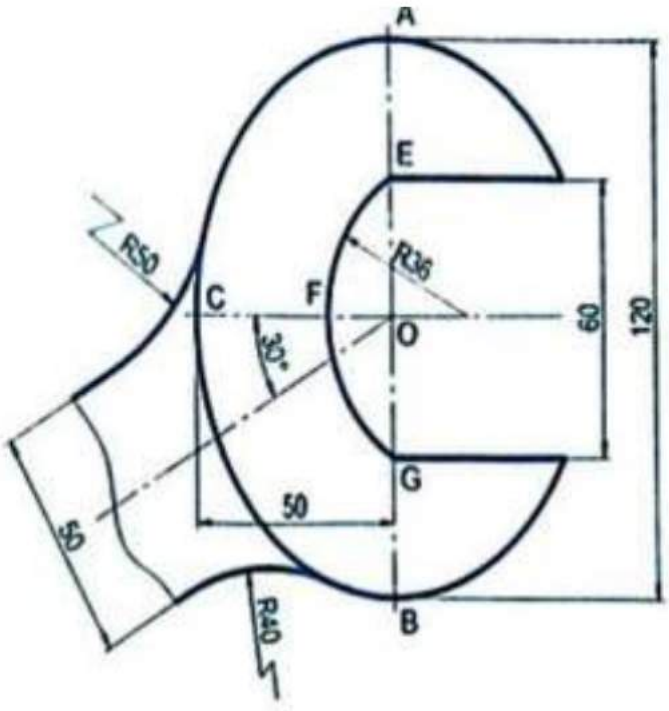
2.4.TANGENCY AND ELLIPSE PRACTICE

a) Make a full-size drawing for the following figures. Locate and mark all centers and tangency points. Don't erase construction lines. "Don't dimension your drawings".

1

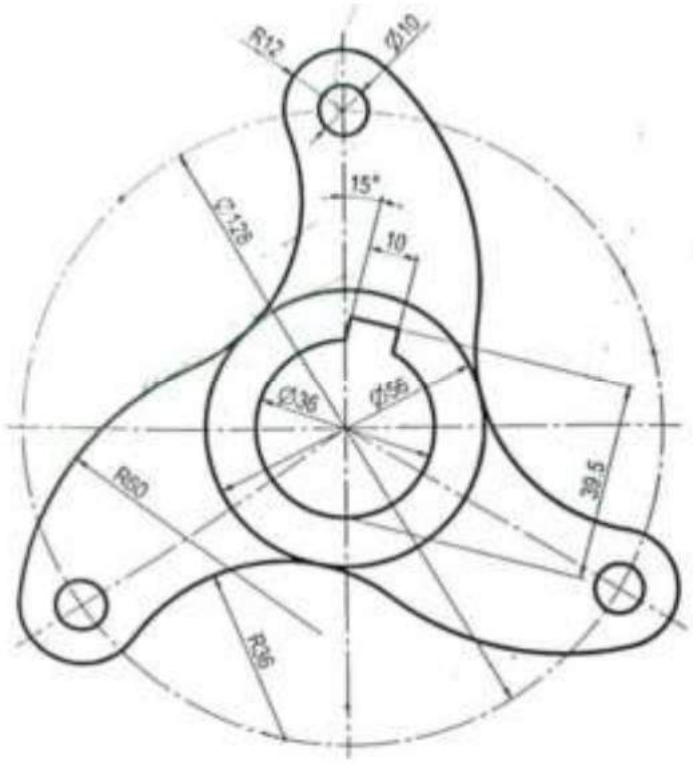


2

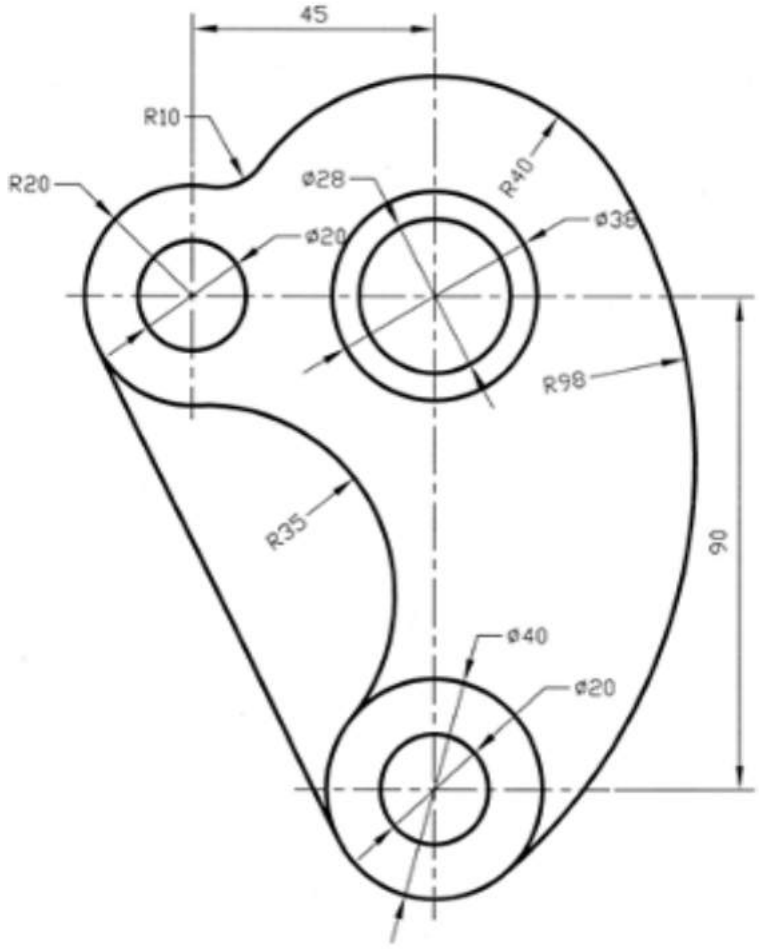


2.5.EXERCISES

1



2



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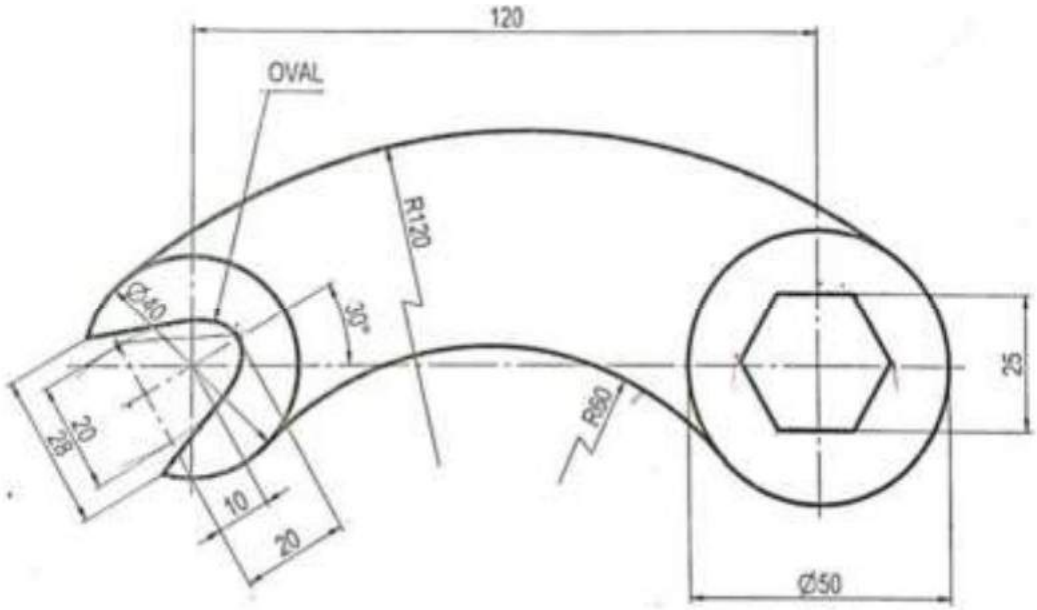
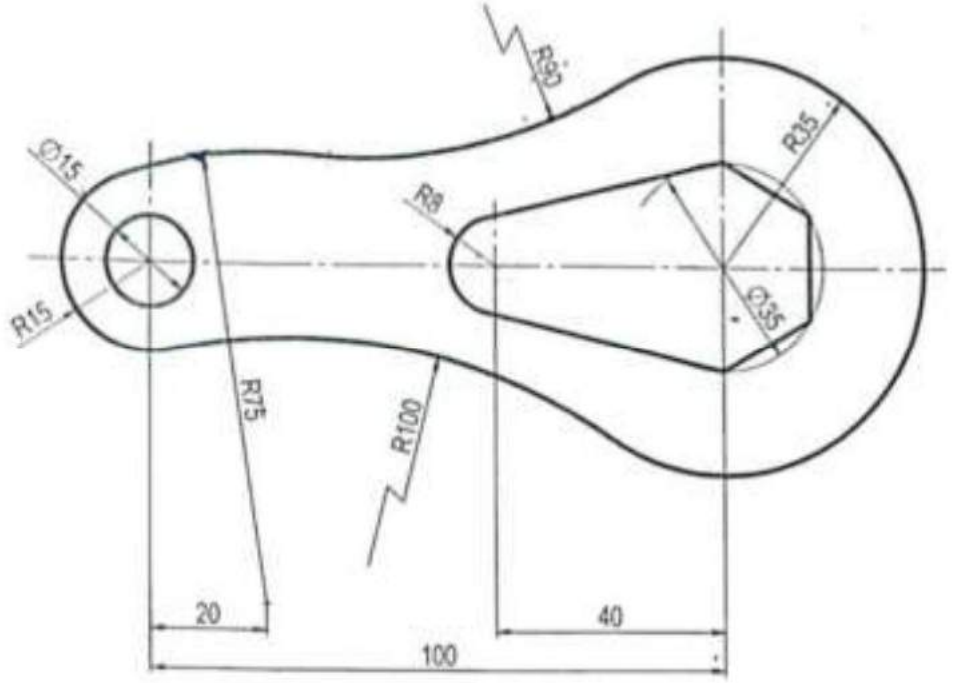
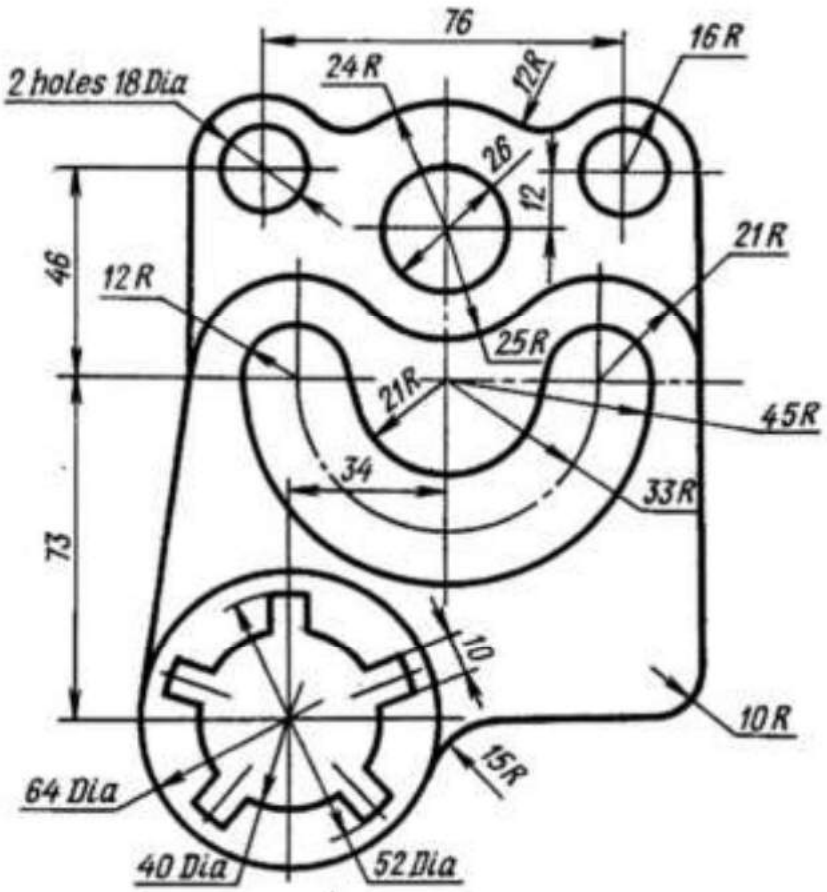

120
OVAL
R120
Ø40
30°
20
28
10
20
R90
25
Ø50

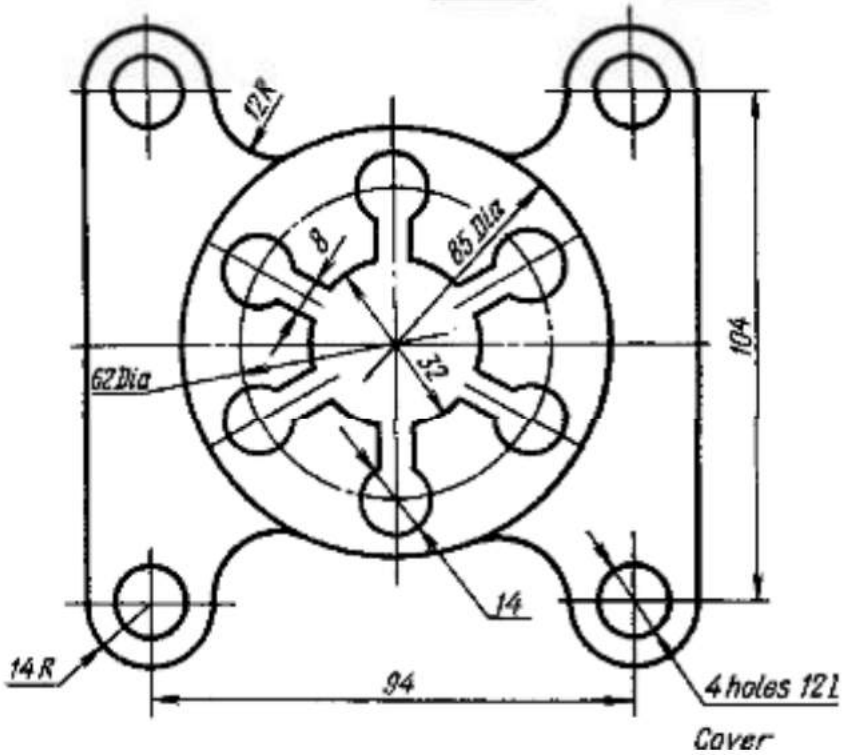
4


R90
R35
Ø15
R8
R15
Ø35
R75
R100
20
40
100

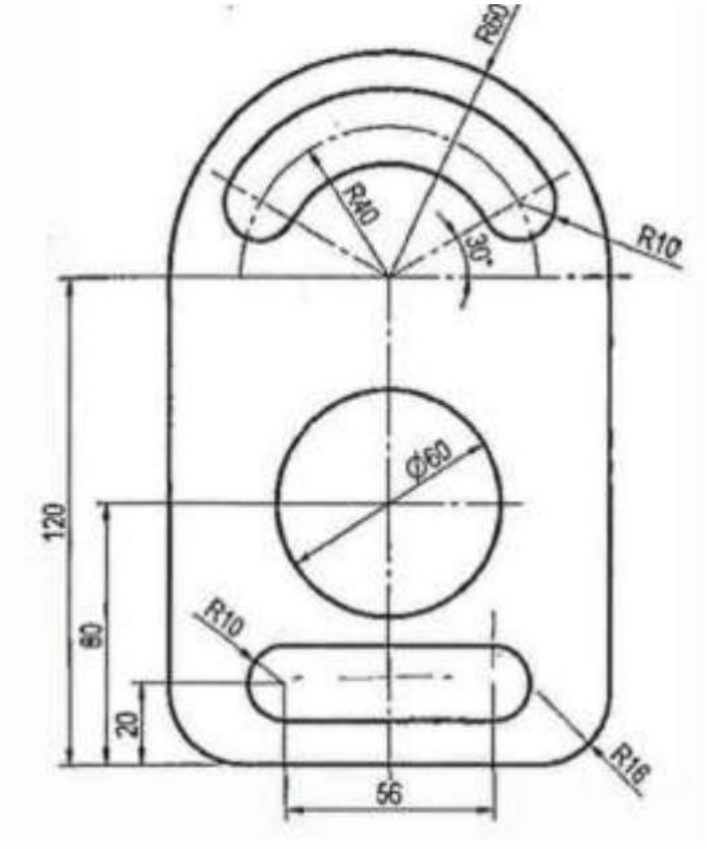
5


76
16R
24R
12R
2 holes 18 Dia
26
12
21R
46
12R
25R
21R
45R
34
33R
73
10
10R
15R
64 Dia
40 Dia
52 Dia

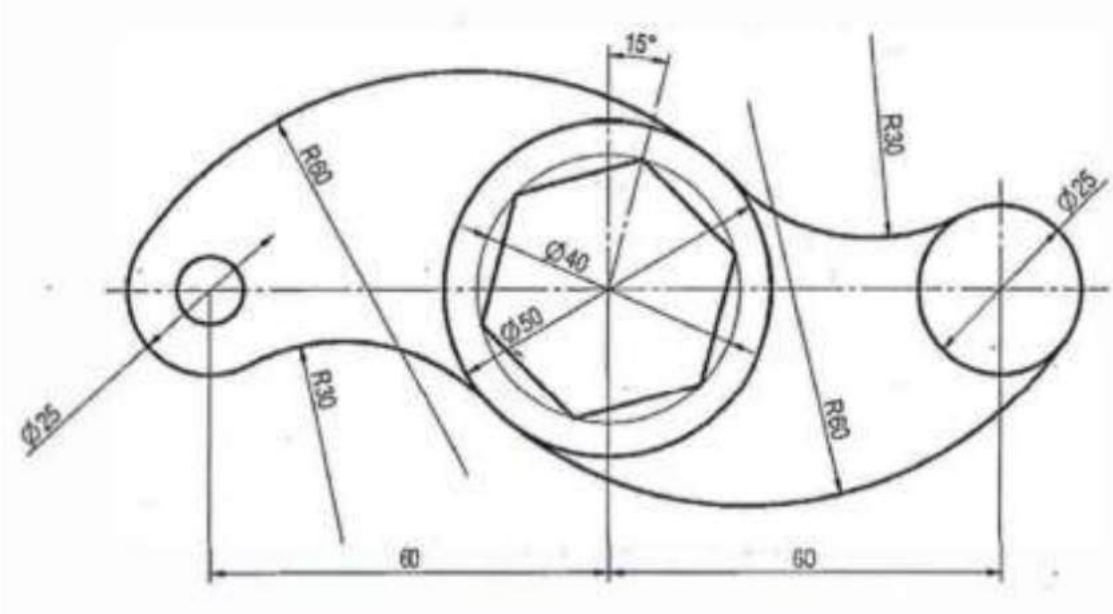
6


12R
85 Dia
8
104
62 Dia
32
14
14R
94
4 holes 12
Cover

7


R50
R40
30°
R10
Ø60
120
60
20
R10
R16
56

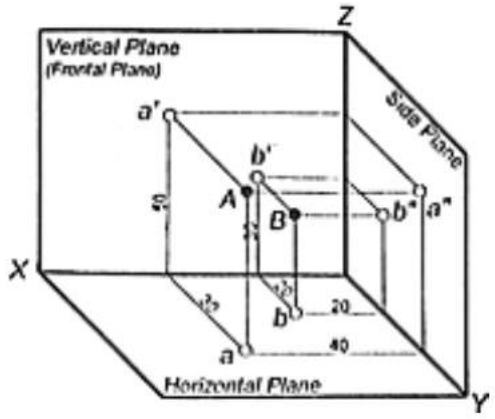
8

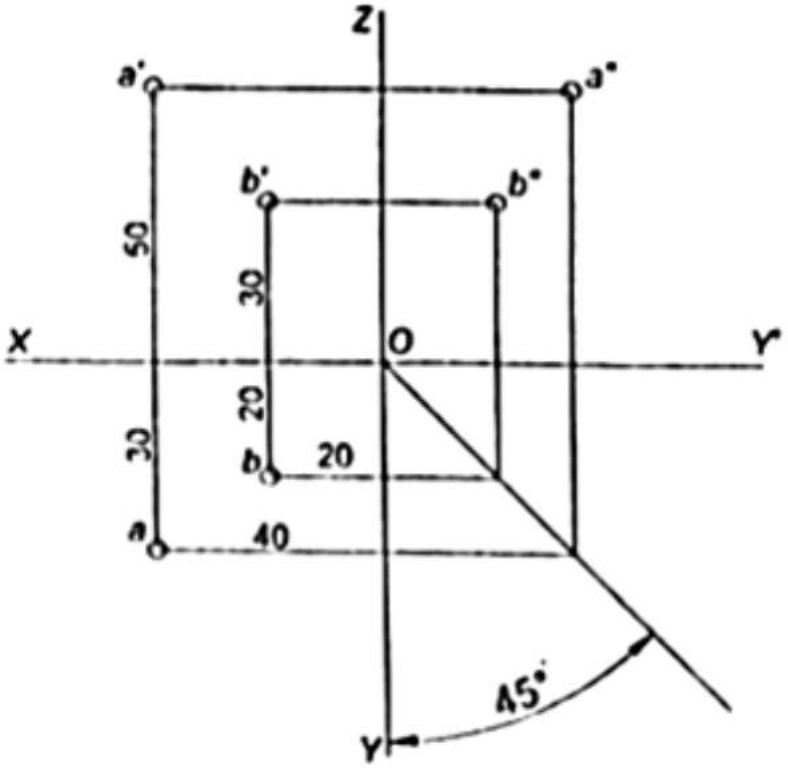

15°
R60
R30
Ø40
Ø50
Ø25
Ø25
R30
R60
60
60

CHAPTER 3 ORTHOGRAPHIC PROJECTION

3.1.POINTS PROJECTION

a) The following is an illustration for an orthographic projection for two points A and B.



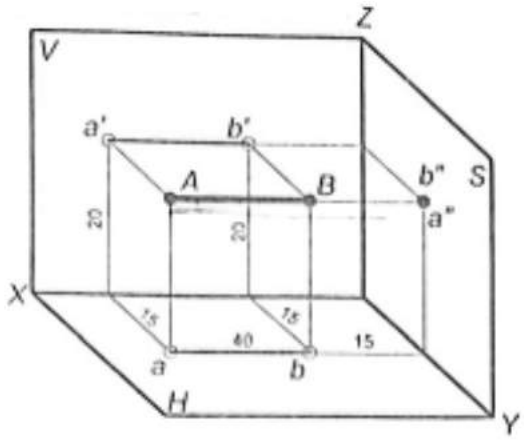


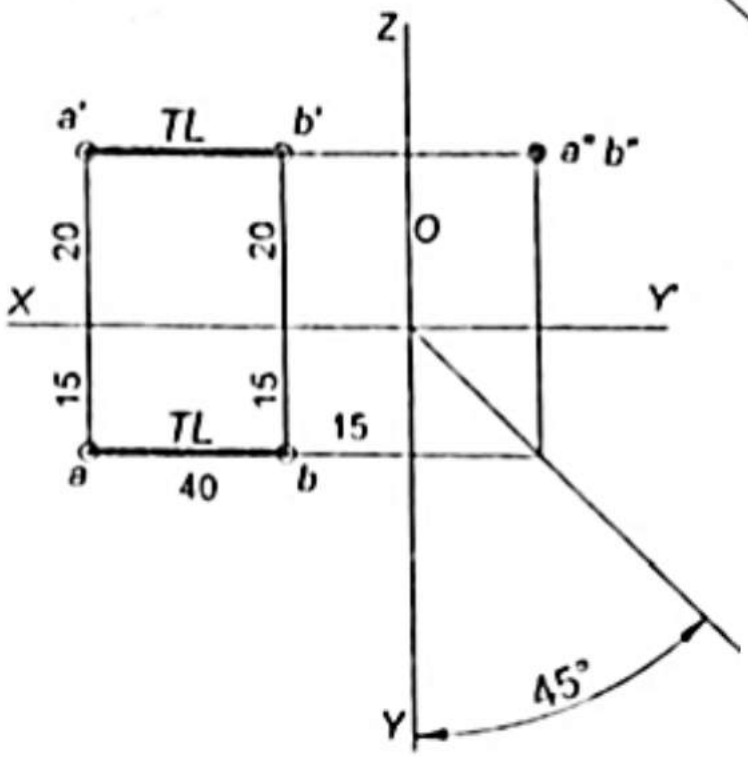
Redraw the points projection using the following coordinates

	A	B
X	30	20
Y	5	35
Z	15	25

3.2.LINES PROJECTION

a) The following is an illustration for an orthographic projection for the line AB.

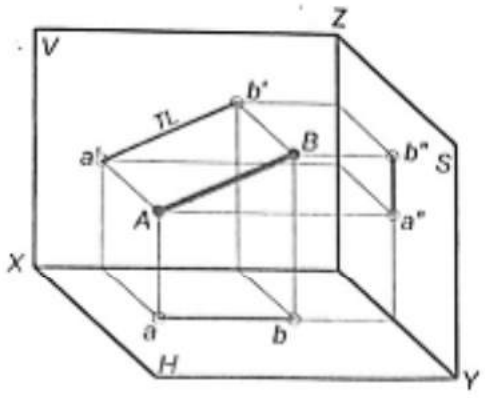


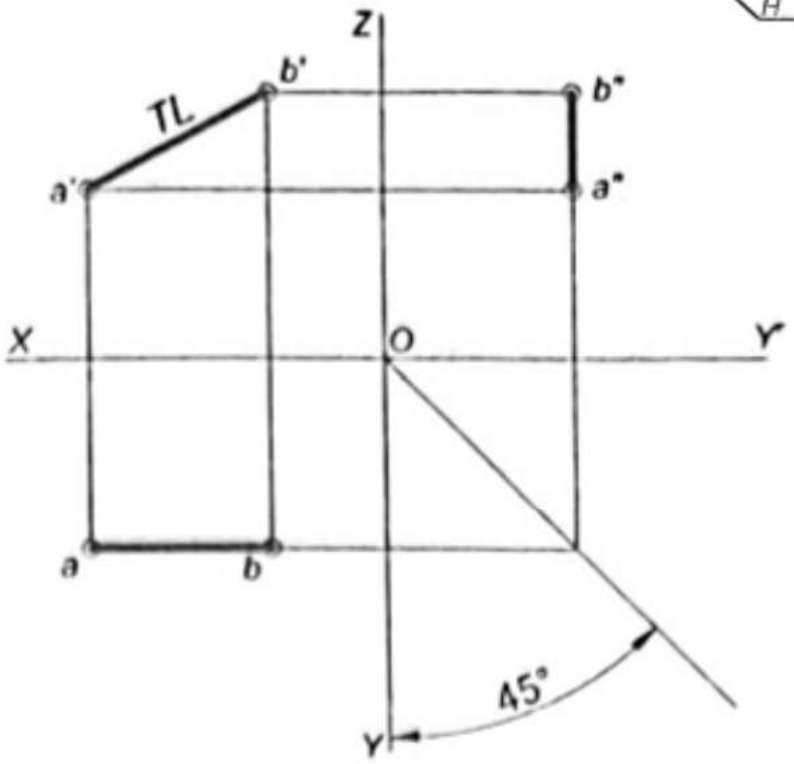


Redraw the line projection using the following coordinates

	A	B
X	35	35
Y	30	30
Z	5	40

b) The following is an illustration for an orthographic projection for the inclined line AB.





Redraw the lines projection using the following coordinates

	Line 1		Line 2	
	A	B	A	B
X	40	10	40	5
Y	10	30	30	5
Z	20	20	5	25

c) Make a complete orthographic drawing of triangle ABC, using the following coordinates of the vertices A, B, and C.

	A	B	C
X	60	30	5
Y	10	40	10
Z	10	50	10

d) Make a complete orthographic drawing of triangle ABC with a point N lying in its plane, using the following coordinates of the vertices A, B, and C

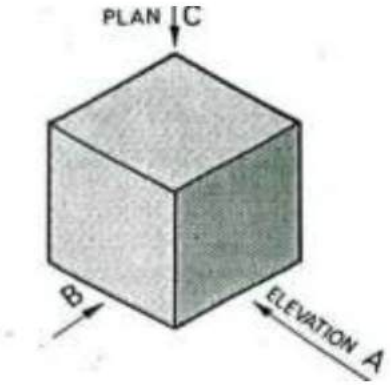
	A	B	C	N
X	60	50	10	45
Y	5	40	20	?
Z	15	35	5	20

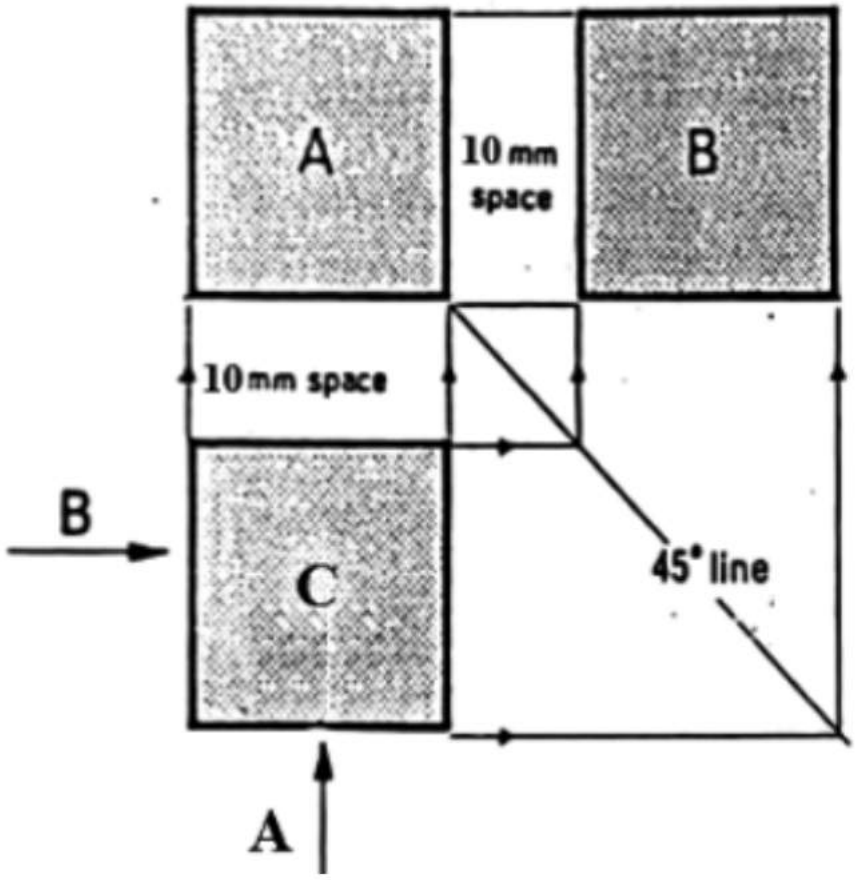
e) Make a complete orthographic drawing of triangle ABC with a point N lying in its plane, using the following coordinates of the vertices ABC.

	A	B	C	N
X	65	40	10	35
Y	20	5	40	20
Z	15	40	5	?

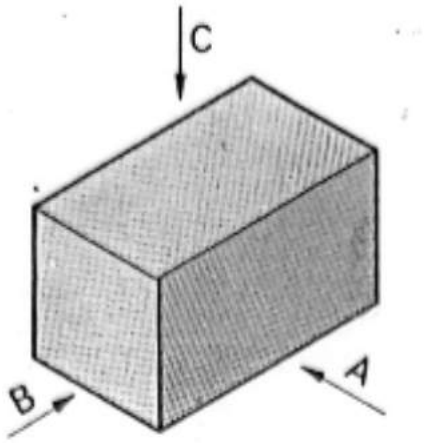
3.3.GEOMETRICAL SOLIDS PROJECTION

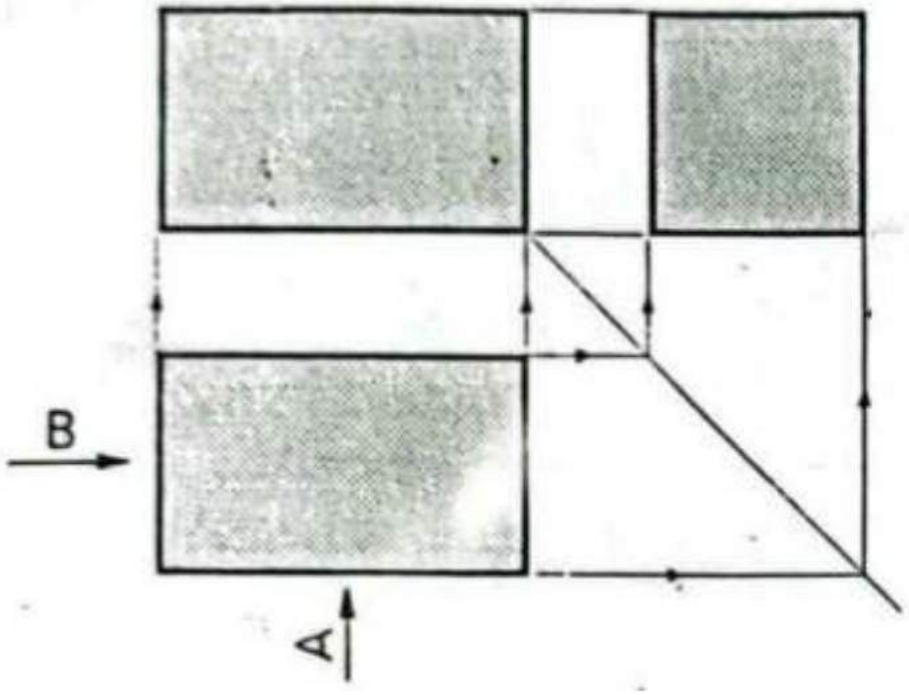
a) The following is an illustration for an orthographic projection for a cube with a 55 mm long edges. Given the plan view of a cube. Draw the elevation, side view, and plan in the direction of arrows A, B, and C. Leave 10 mm spaces between all views.



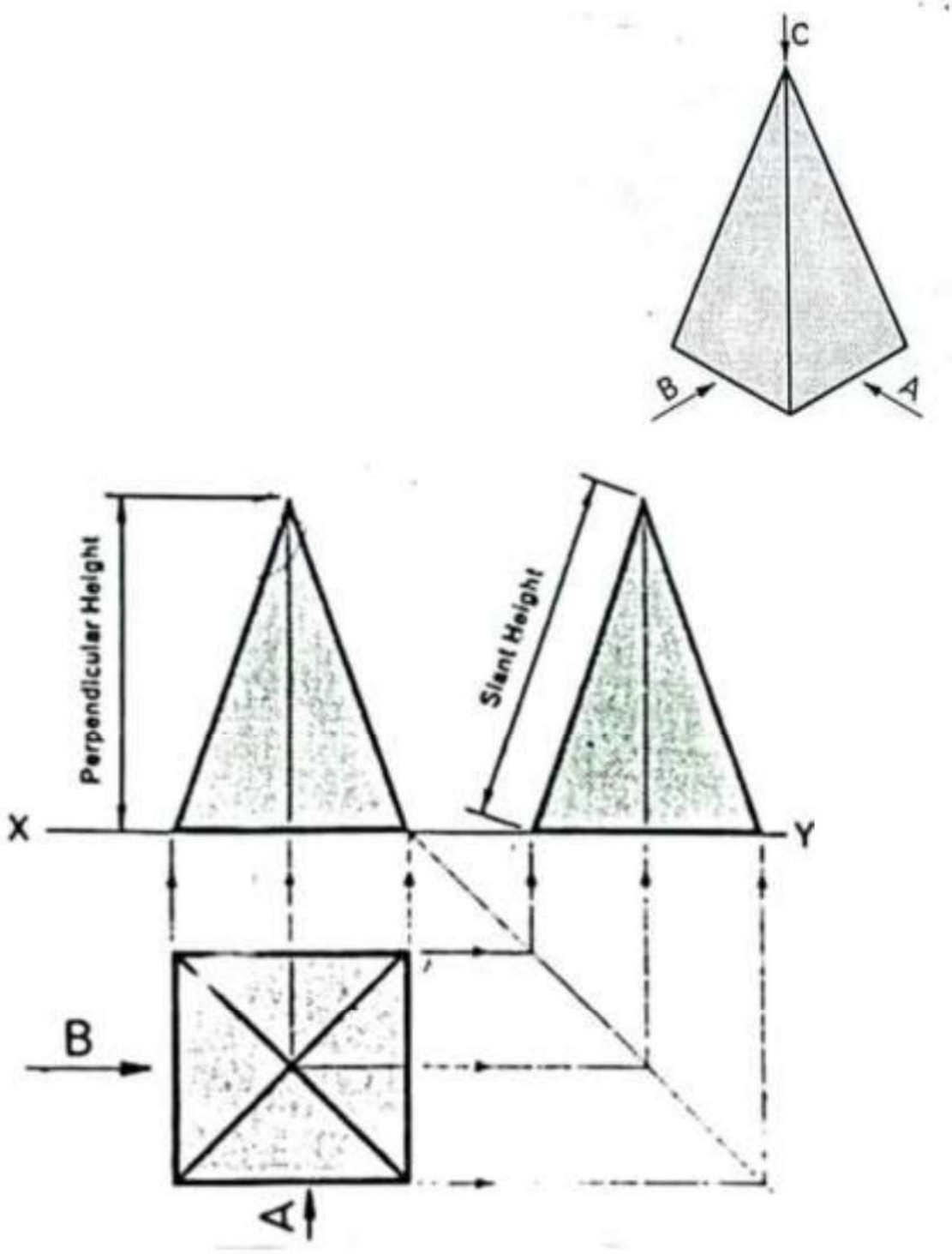


b) Draw in three views of the square prism shown. The end is 30 mm square and the length is 50 mm

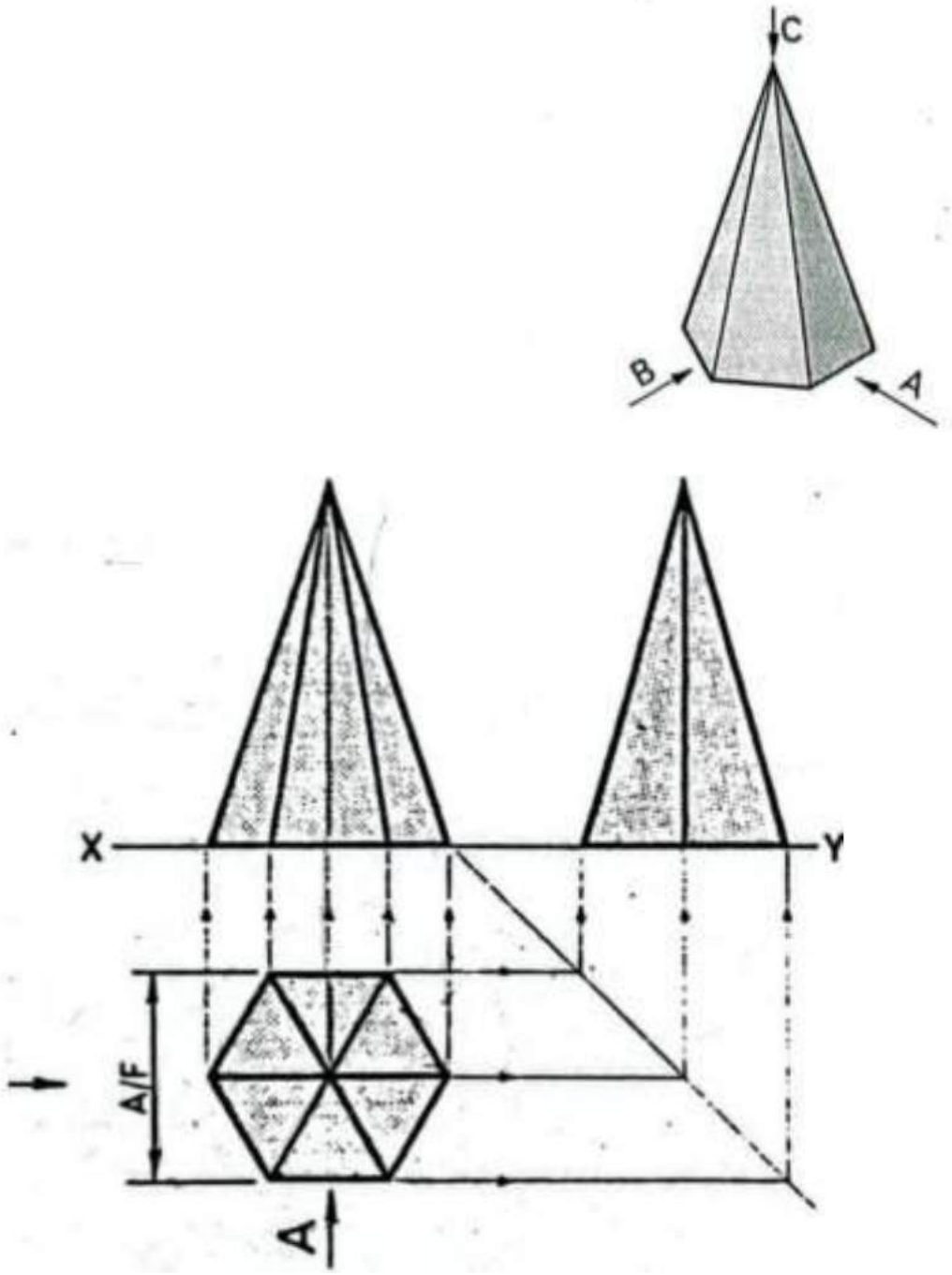




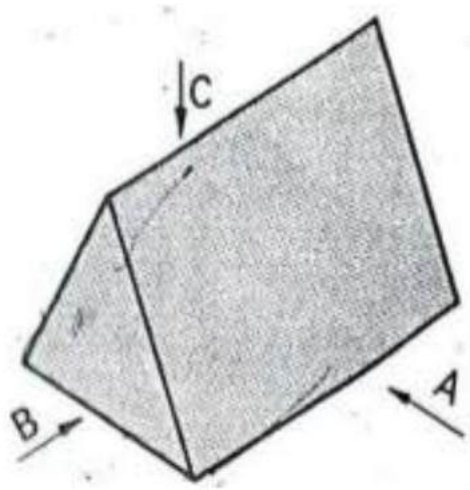
c) Copy the three views of the square pyramid. The base is 40 mm square, and the perpendicular height is 60 mm as indicated.

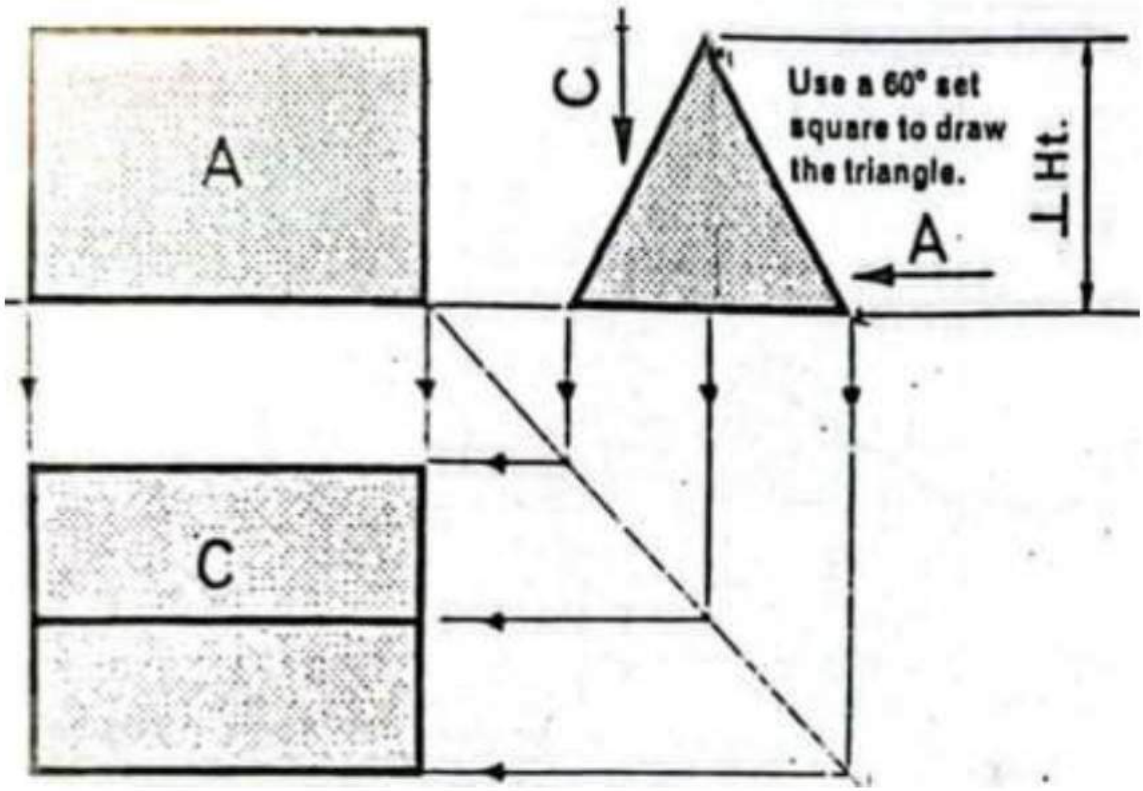


d) Copy the views of the hexagonal pyramid. The perpendicular height is 60 mm and each side of the hexagonal base measures 20 mm.

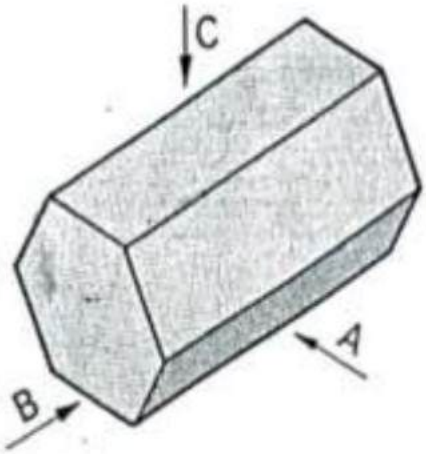


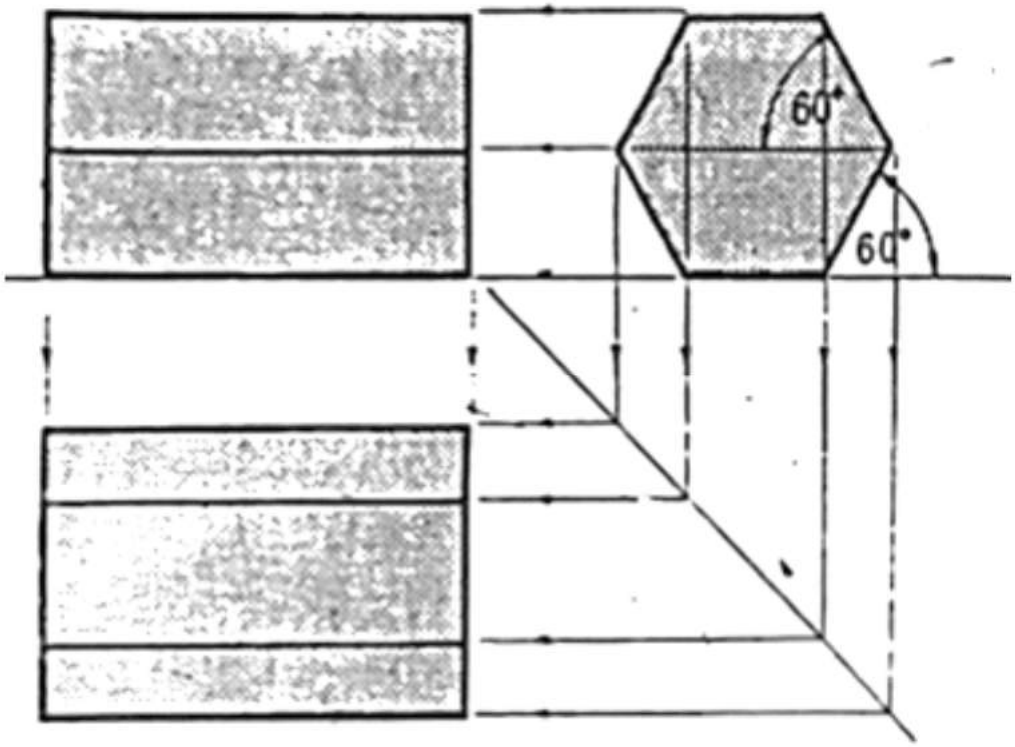
e) Copy the three views of the triangular prism. It is 50 mm long; the end is an equilateral triangle each side of which measures 40 mm (Note: draw the right-hand elevation first to obtain the prism's perpendicular height.)





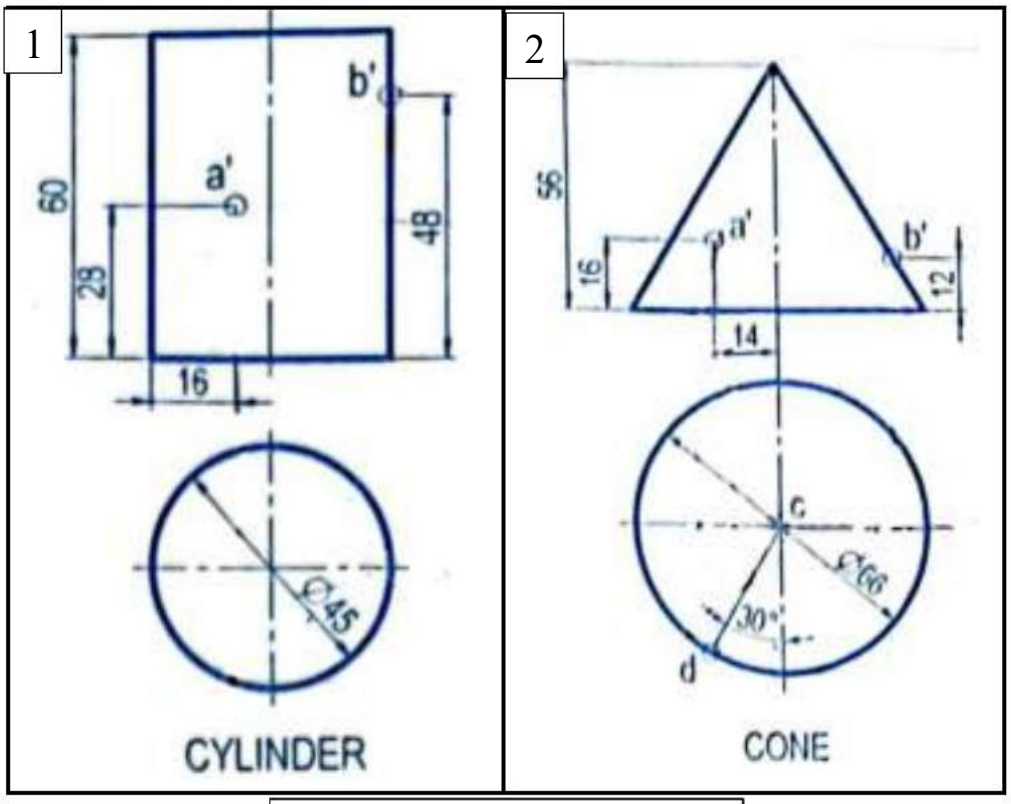
f) The drawing shows three views of a hexagonal prism of length 60 mm. Each side of the hexagon measures 20 mm. Copy these views. (Note: draw the elevation showing the hexagon first using a 60^{o} set square)

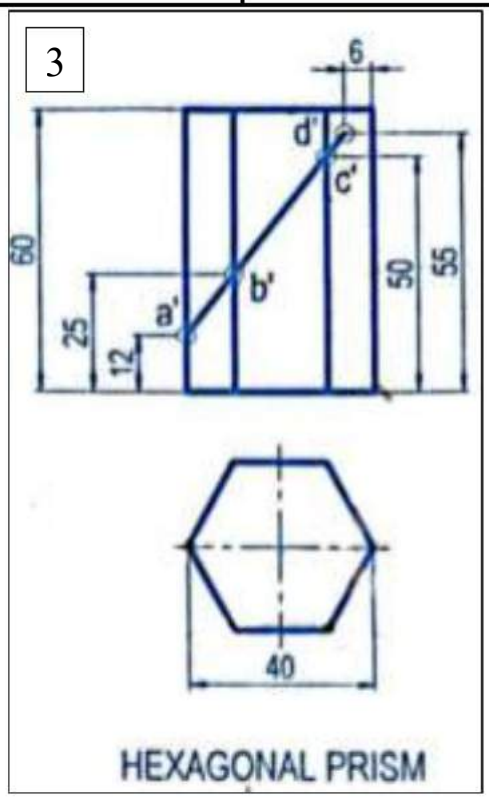




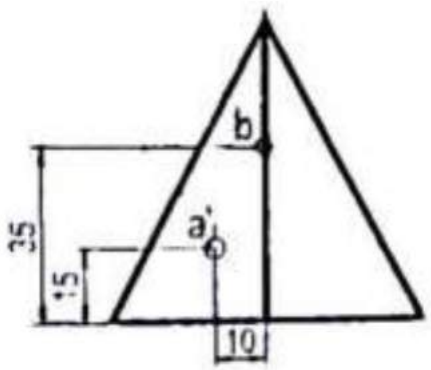
3.4.INTERSECTION POINTS IN SOLID PROJECTIONS

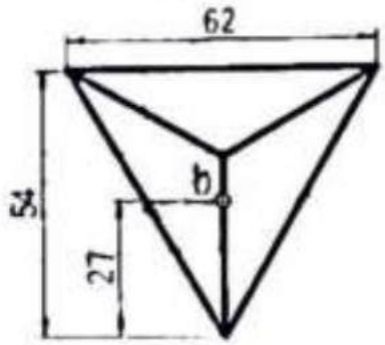
a) Redraw the following shapes including the indicated intersection points and lines





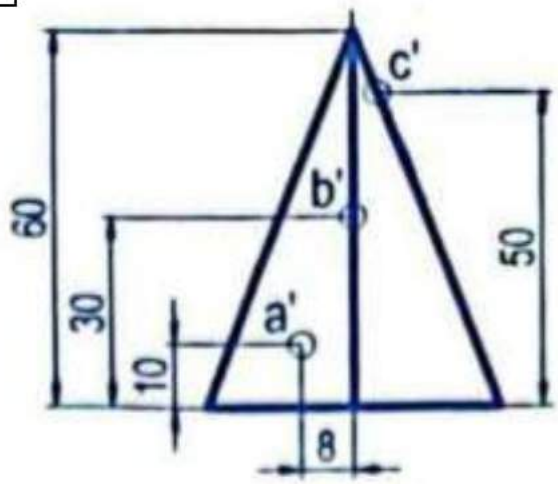
4

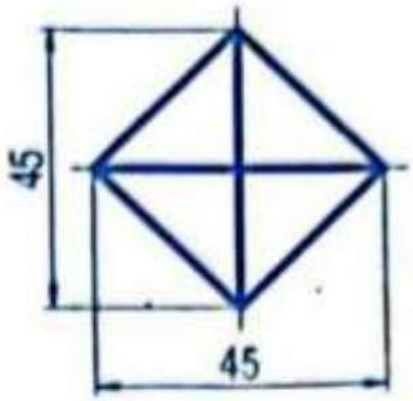




TRIANGULAR PYRAMID

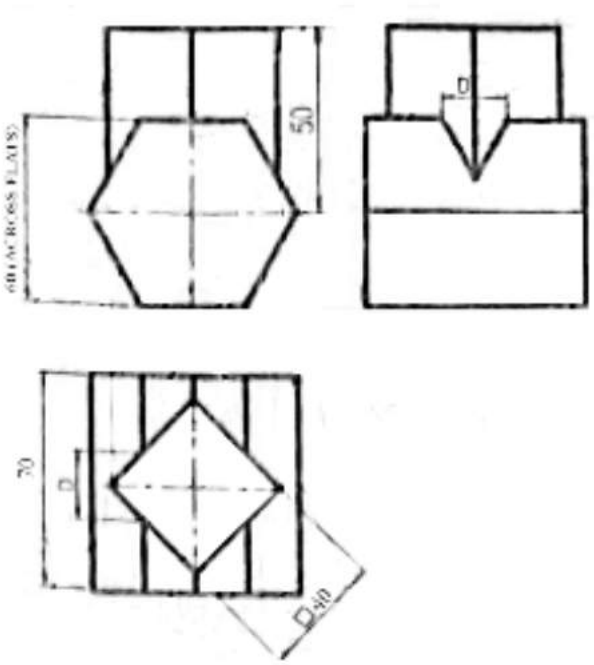
5



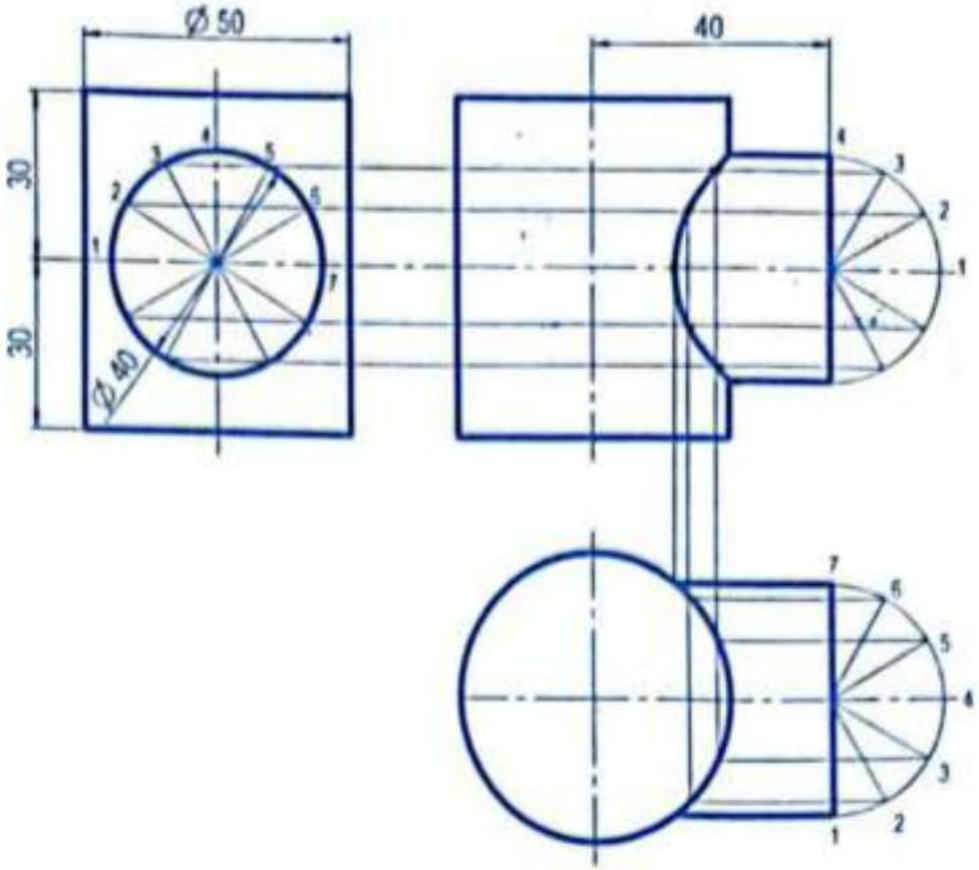


3.5.INTERSECTION BETWEEN SOLIDS

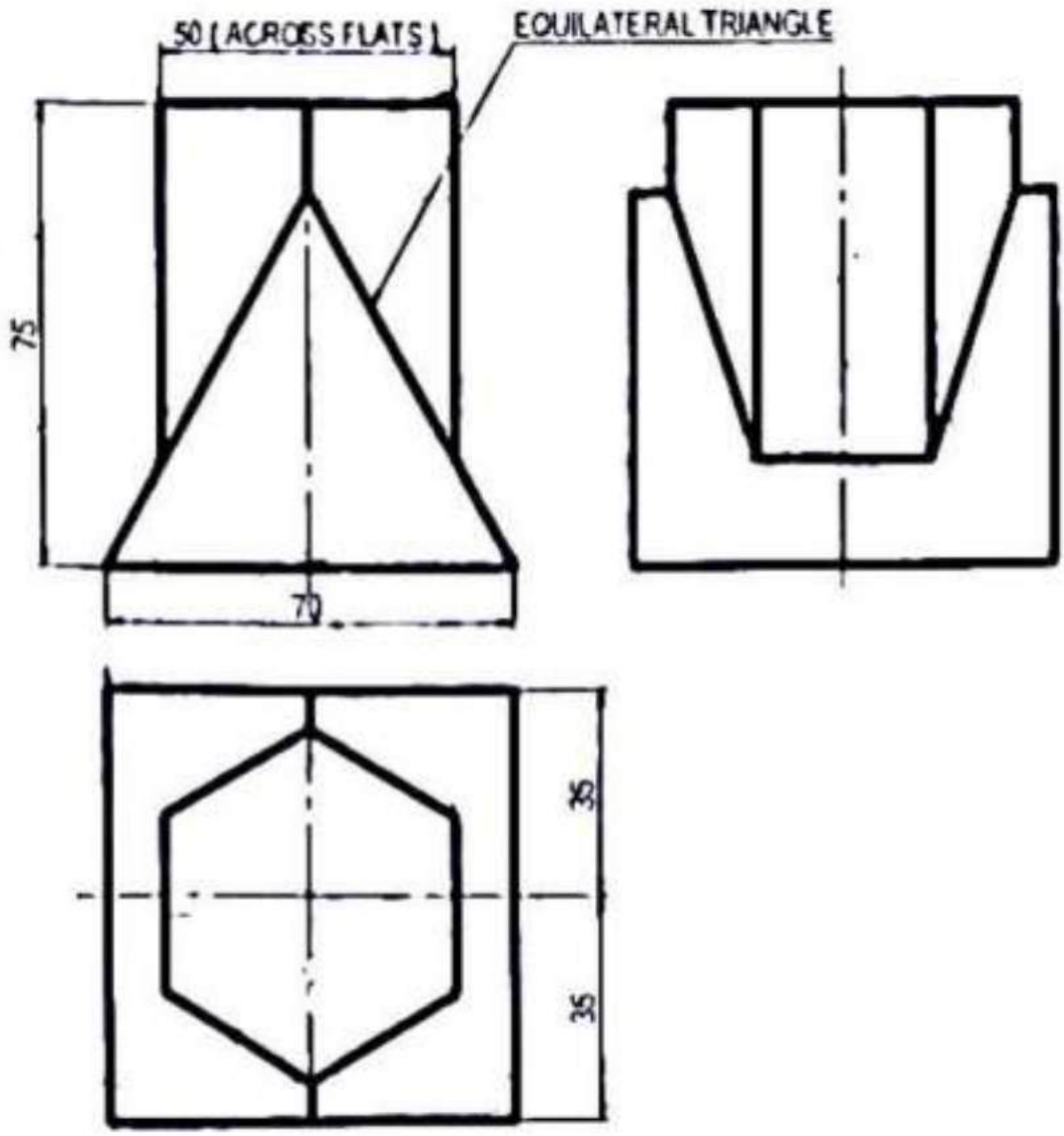
a) Redraw the following projected views



b) Redraw the following projected views



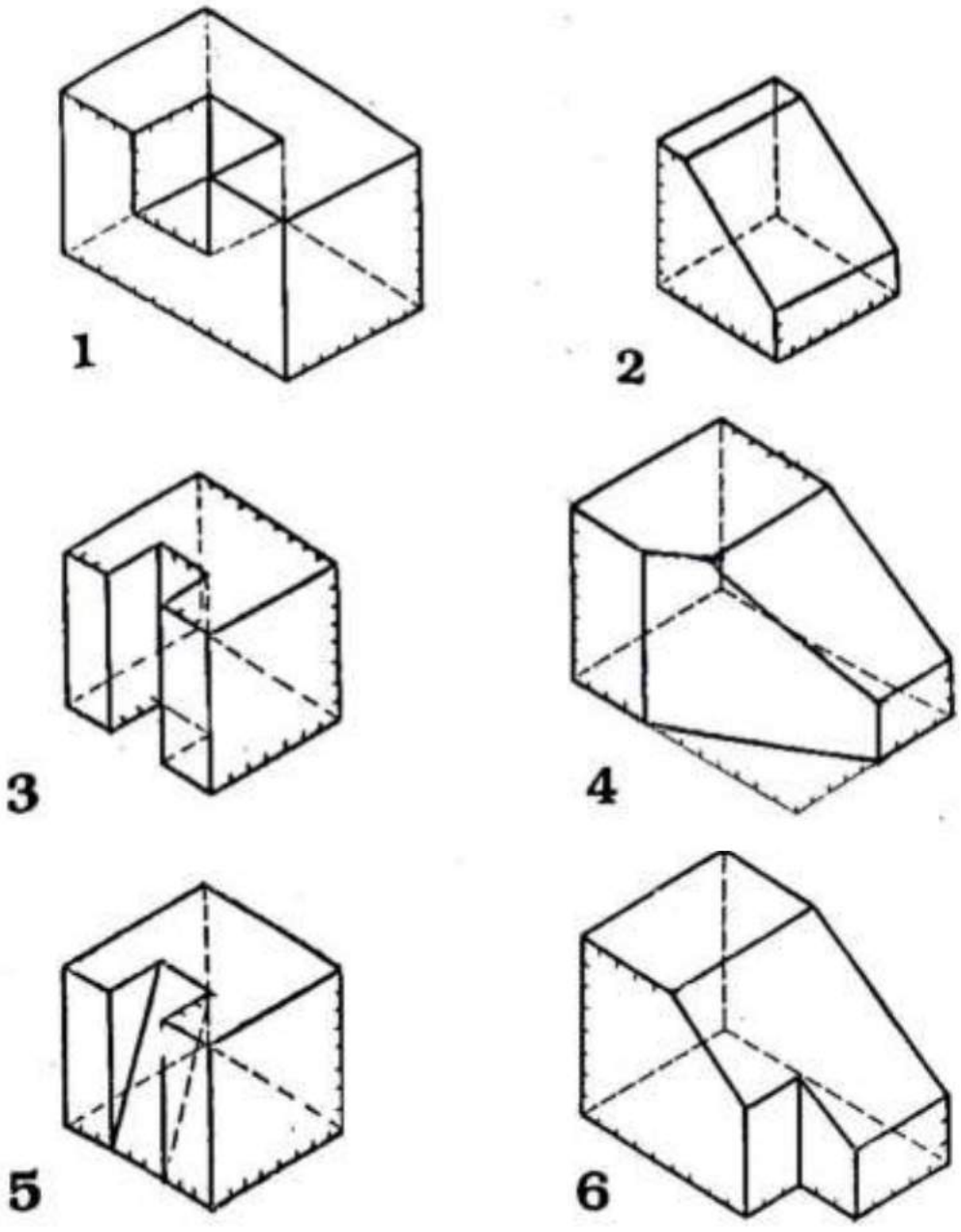
c) Redraw the following projected views

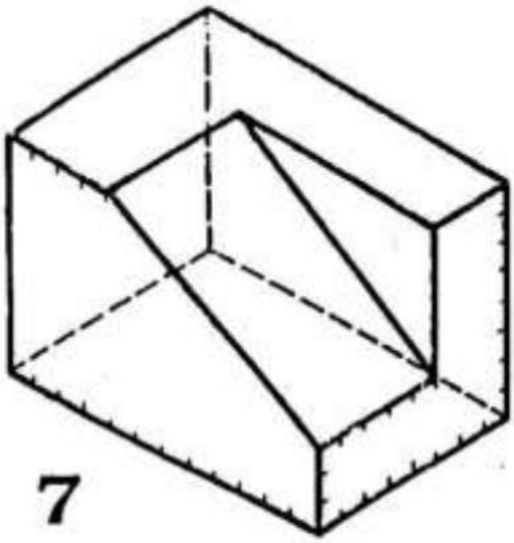


CHAPTER 4 MULTIVIEW DRAWING

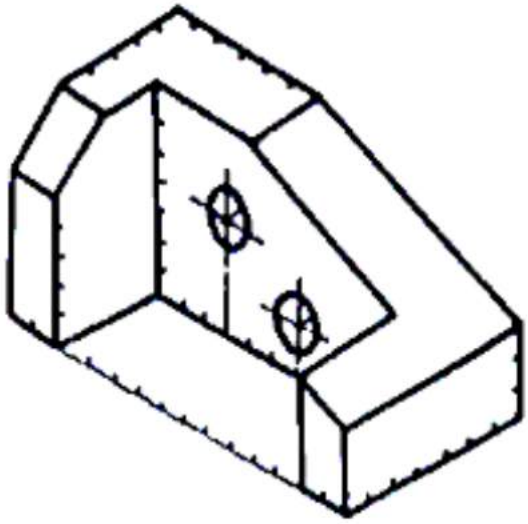
4.1. ORTHOGRAPHIC PROJECTION FROM ISOMETRIC

a. Draw these objects in orthographic (draw the elevation, plane, and side views), using freehand sketch.

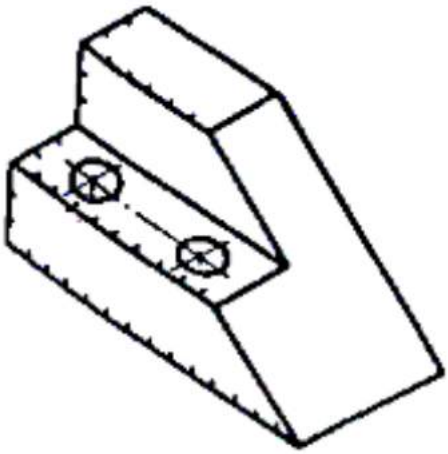




7



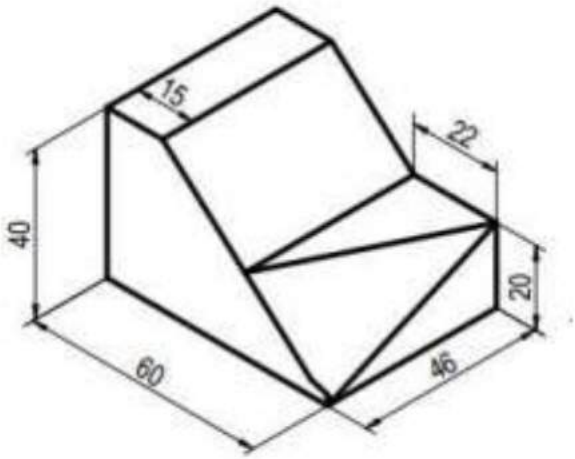
8



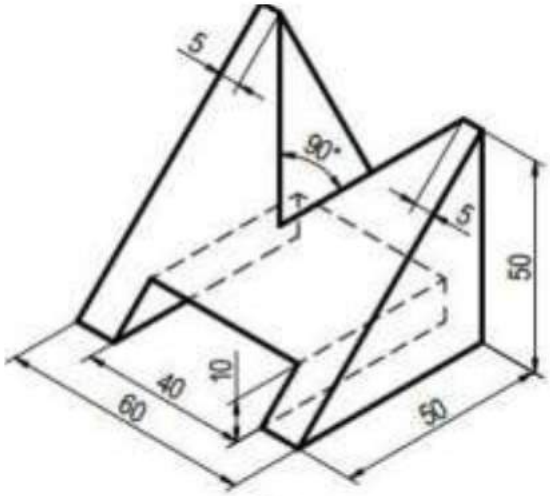
9

b. Draw the Elevation , Plan and Right side view for each of the shown solids using the rules of engineering drawing.

1



2



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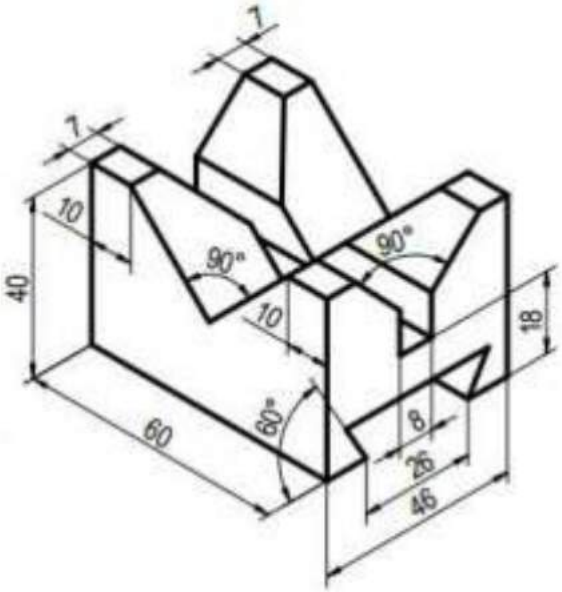

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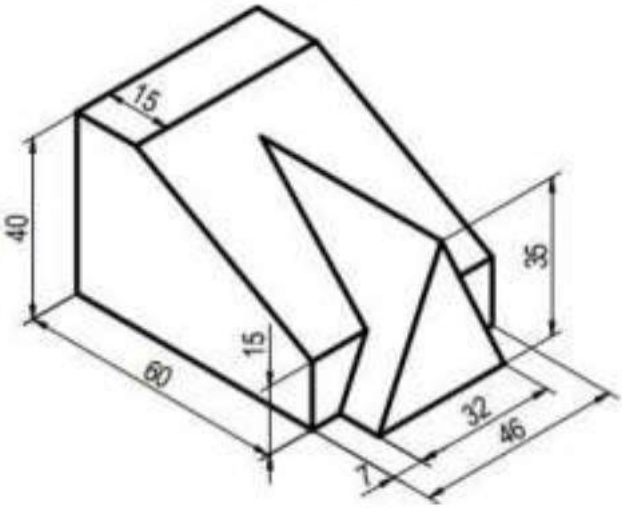

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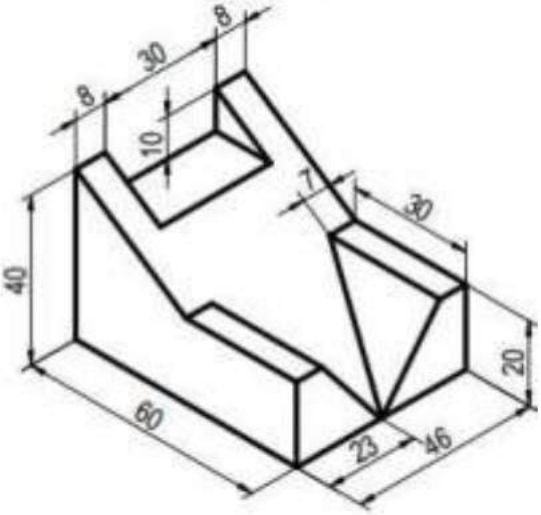

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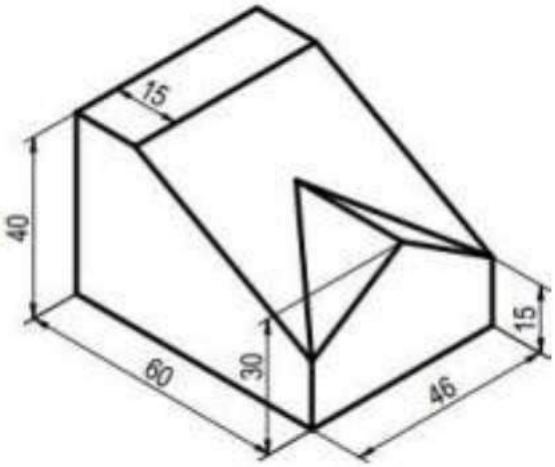
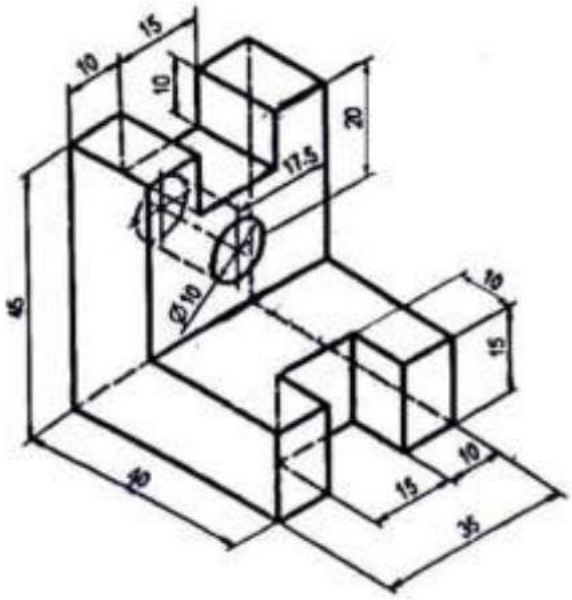
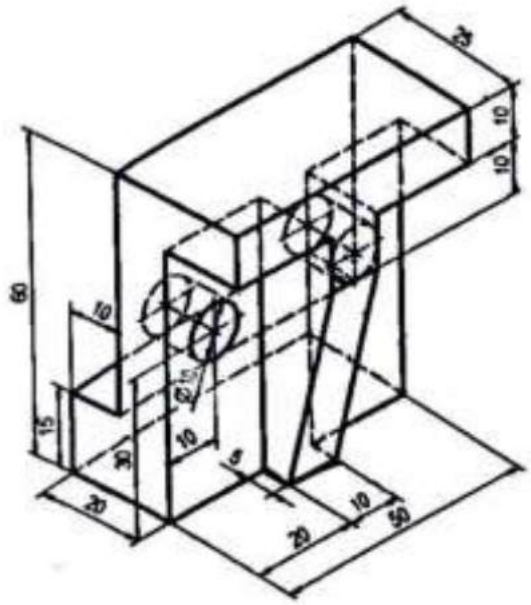


c. Draw these objects in orthographic (draw the elevation, plane, and side views), using suitable drawing paper

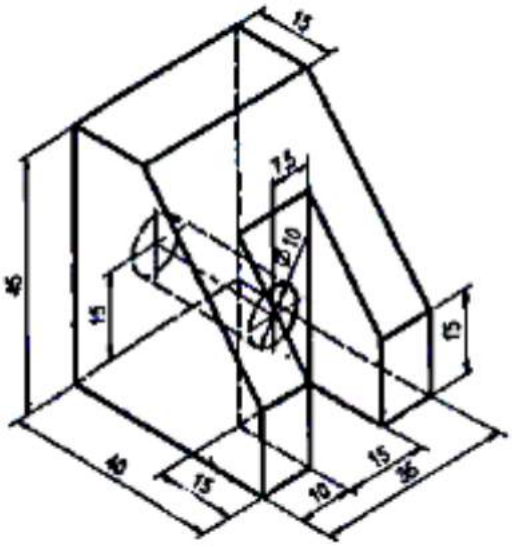
1



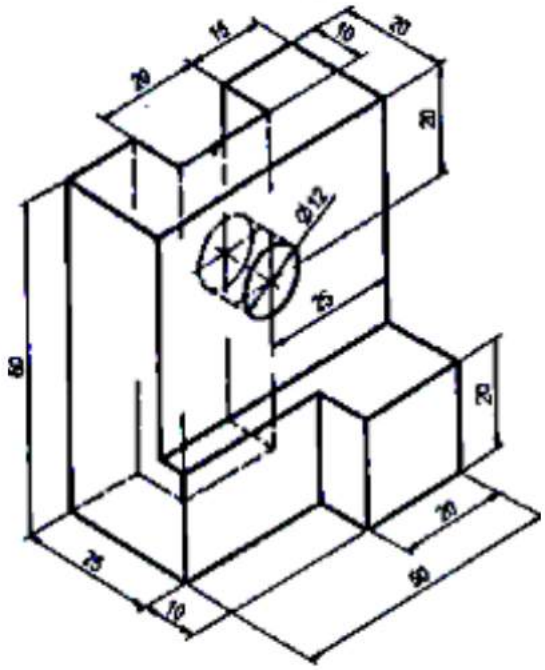
2



3



4



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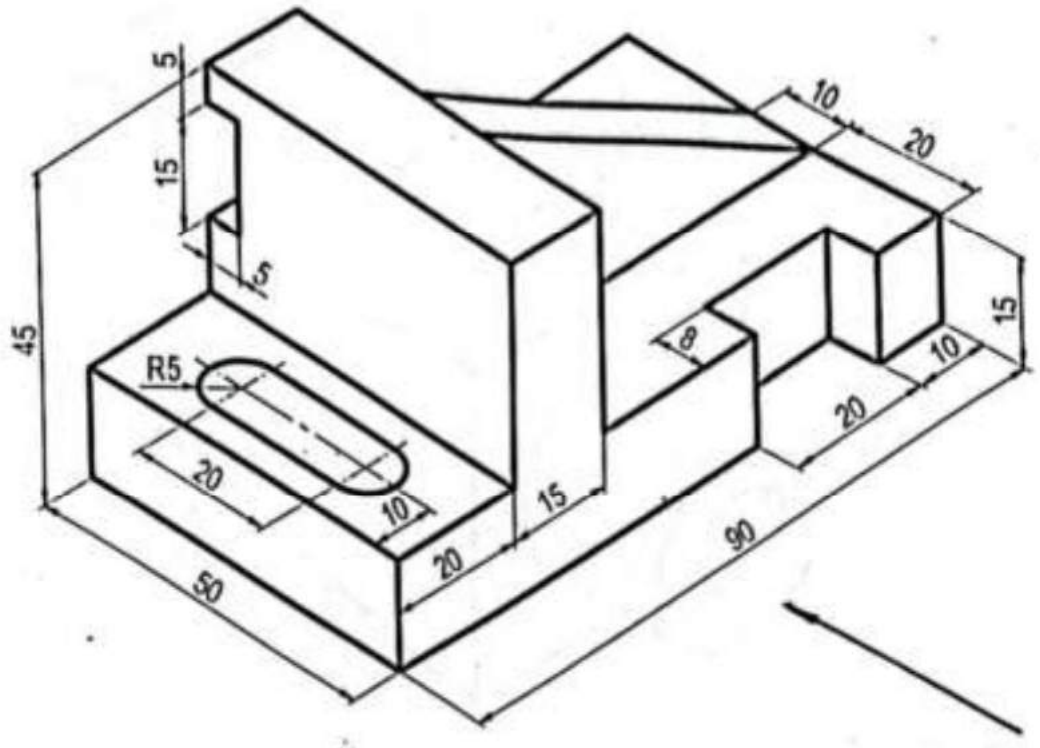
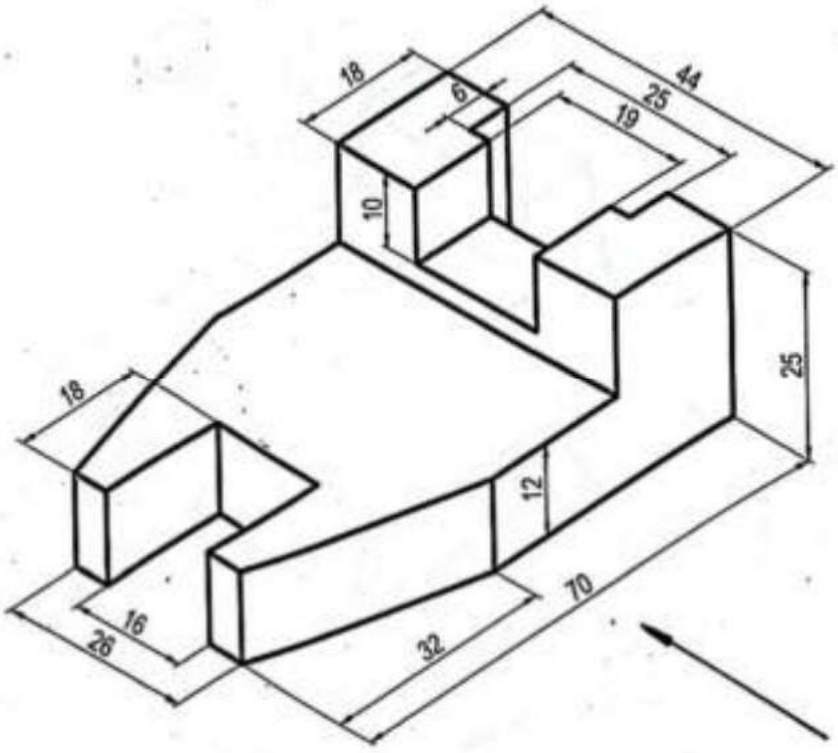
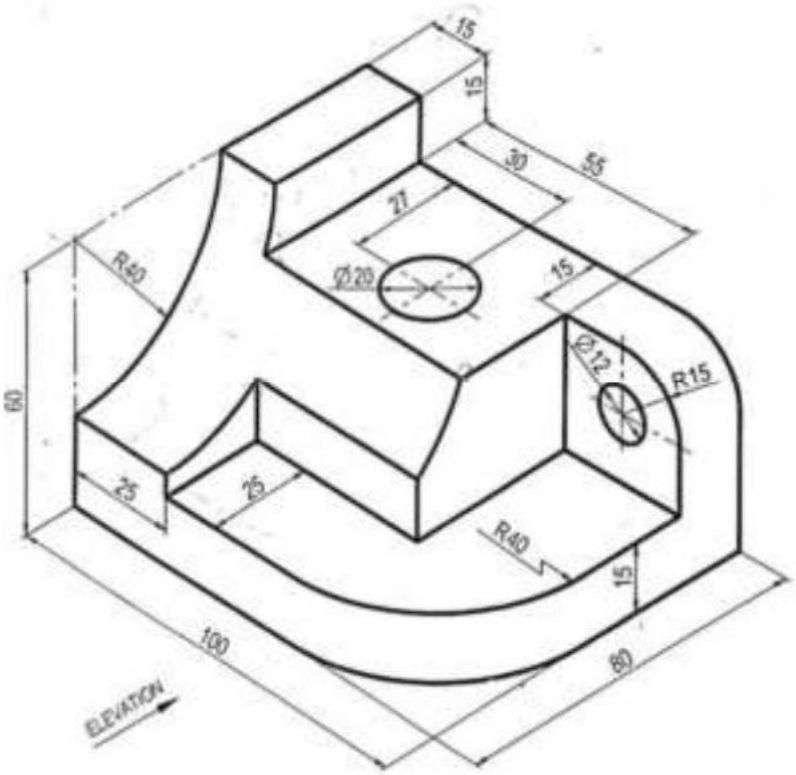

5
15
5
45
R5
20
10
50
20
15
90
10
20
8
20
10
15

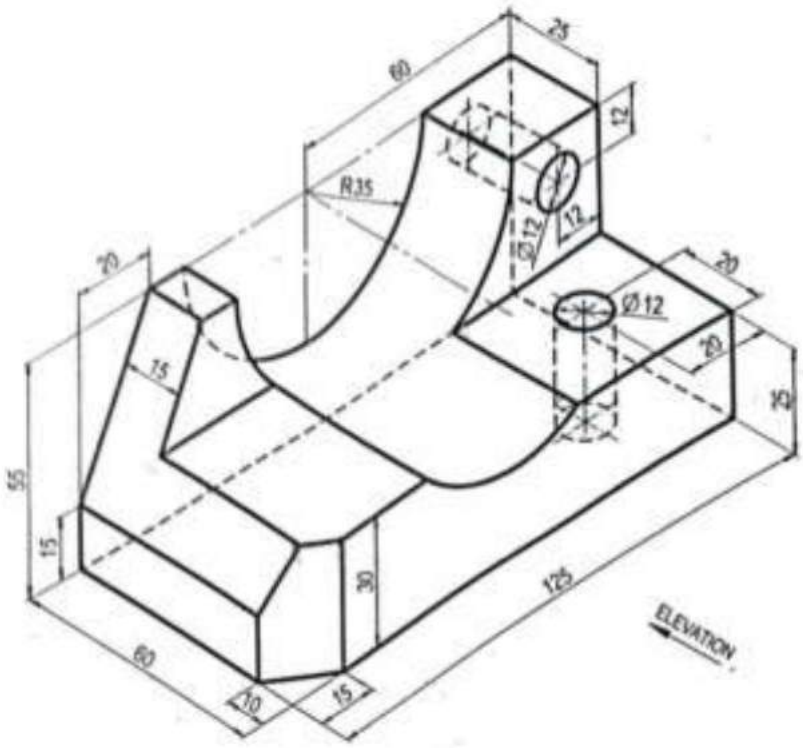
6


18
6
44
25
19
10
25
18
12
70
16
26
32

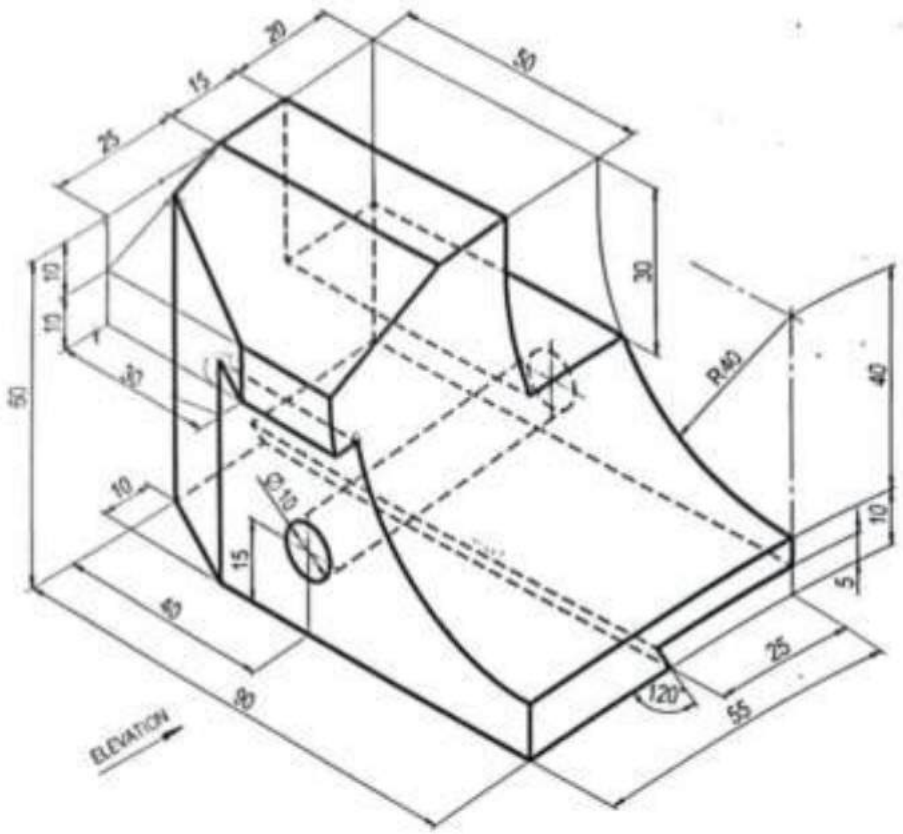
7


15
15
30
55
27
R40
Ø20
15
Ø12
R15
60
25
25
R40
15
100
80
ELEVATION

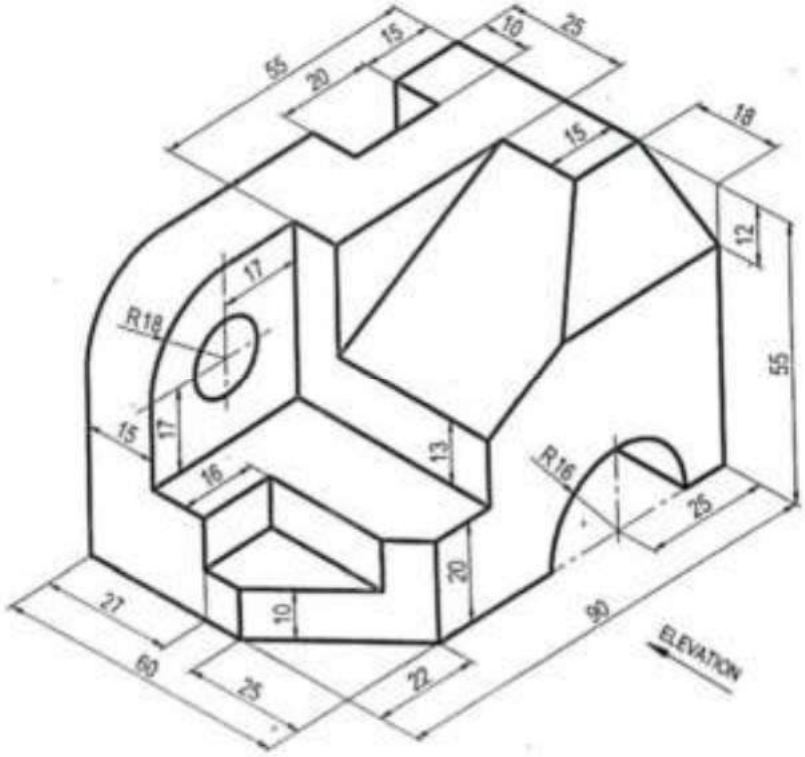
8


25
60
12
R35
Ø12
12
20
20
Ø12
20
15
55
15
30
125
60
10
15
ELEVATION

9


20
15
25
50
30
10
10
30
50
R40
40
10
Ø10
15
10
5
40
90
25
120°
55
ELEVATION

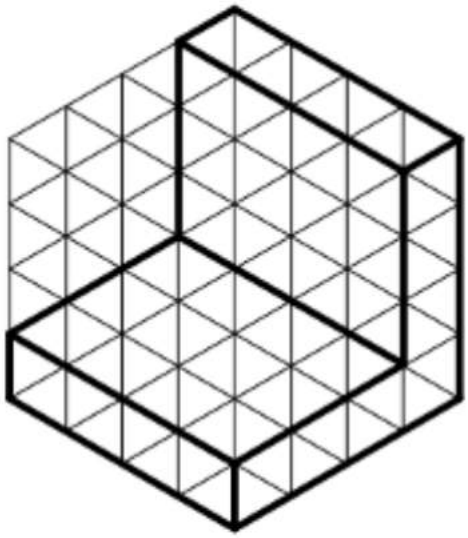
10


55
15
20
10
25
18
15
12
17
R18
55
15
17
16
13
R16
25
20
27
10
90
60
25
22
ELEVATION

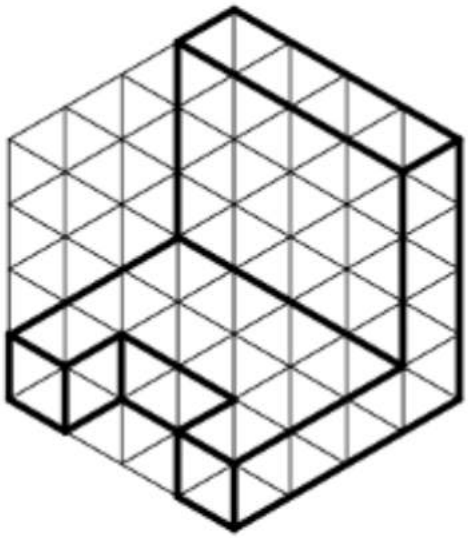
CHAPTER 5 PICTORIAL DRAWING

5.1.Draw a freehand sketch **isometric** for the following, using suitable graph paper

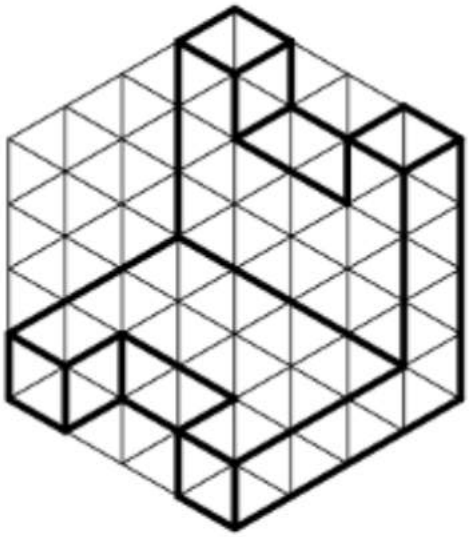
1



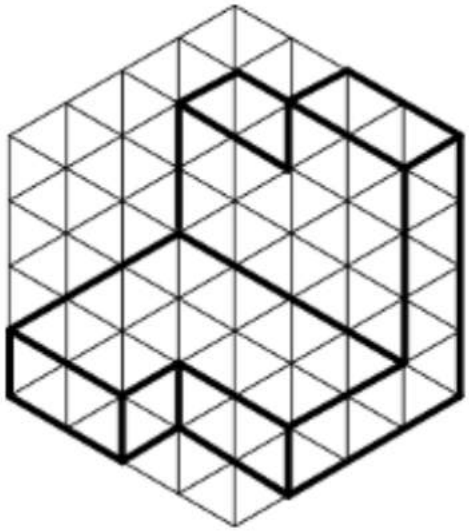
2



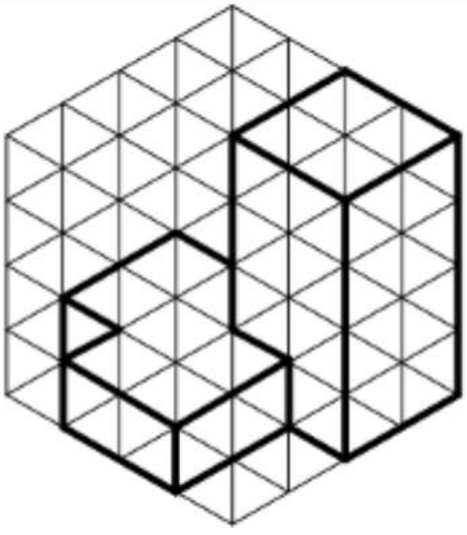
3



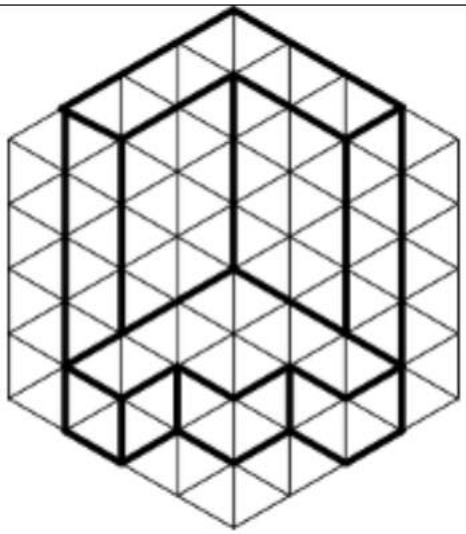
4

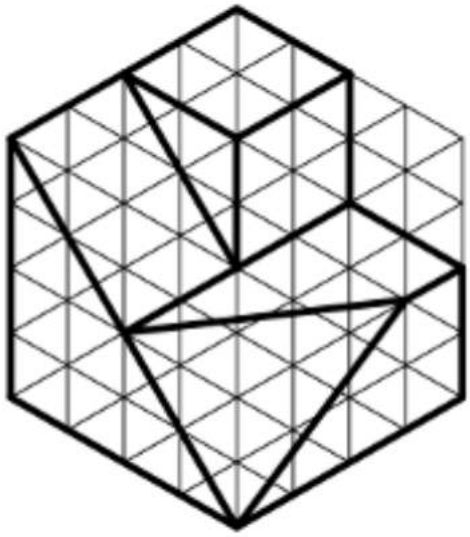


5

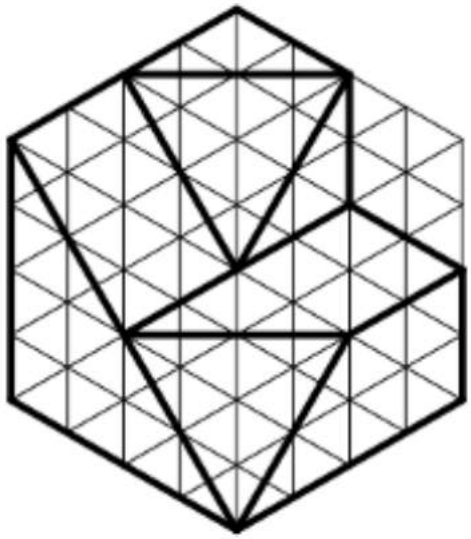


6

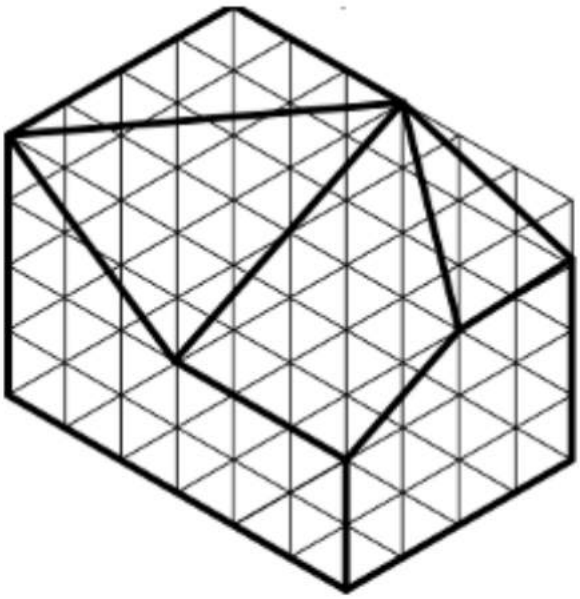




7



8



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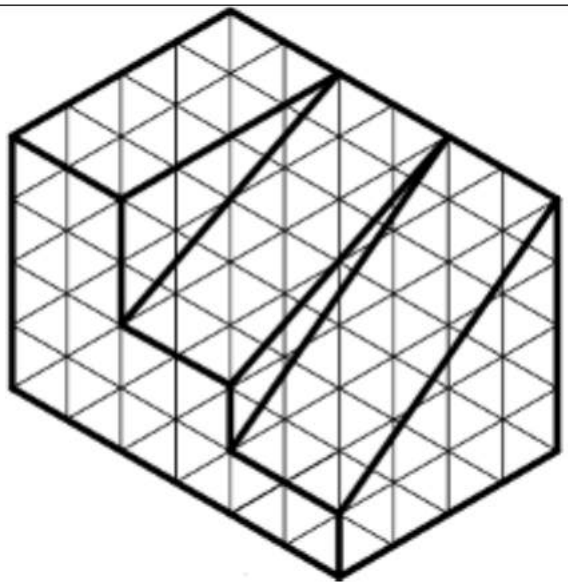
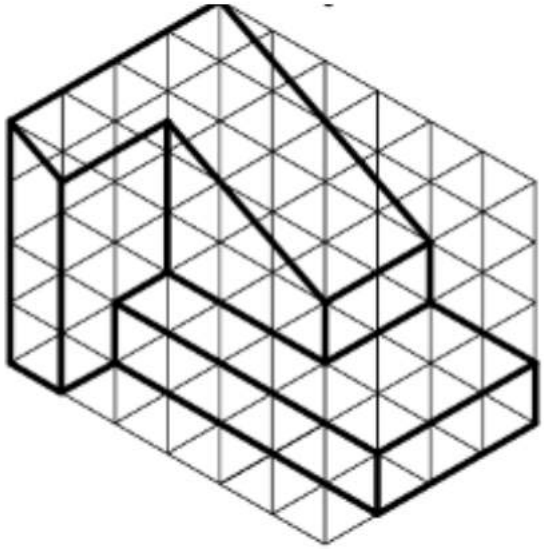
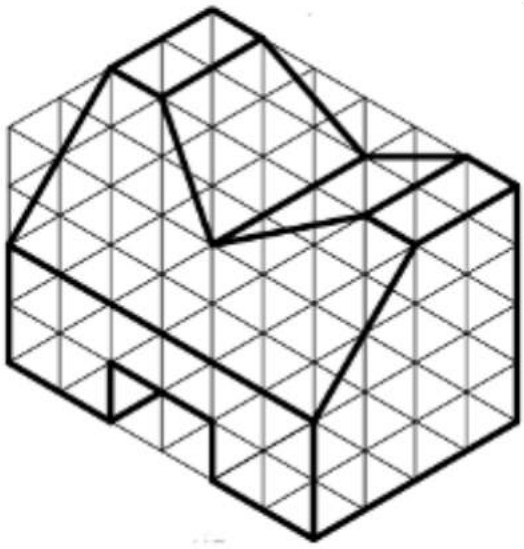


10

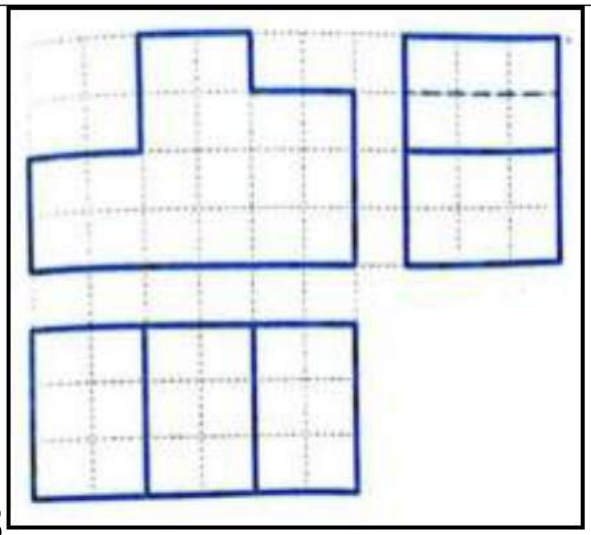


11

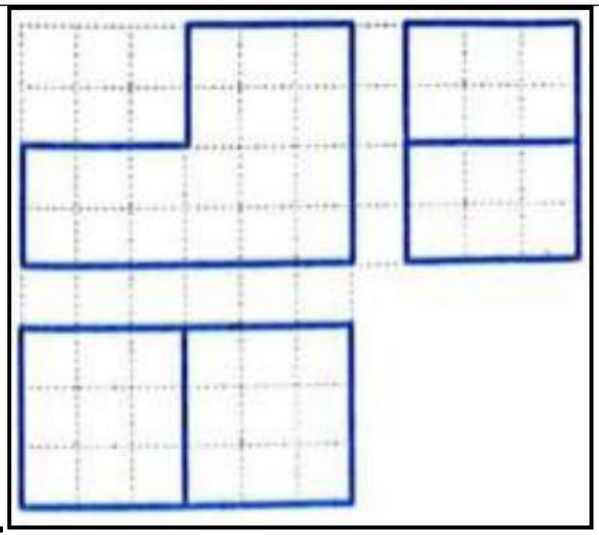


12

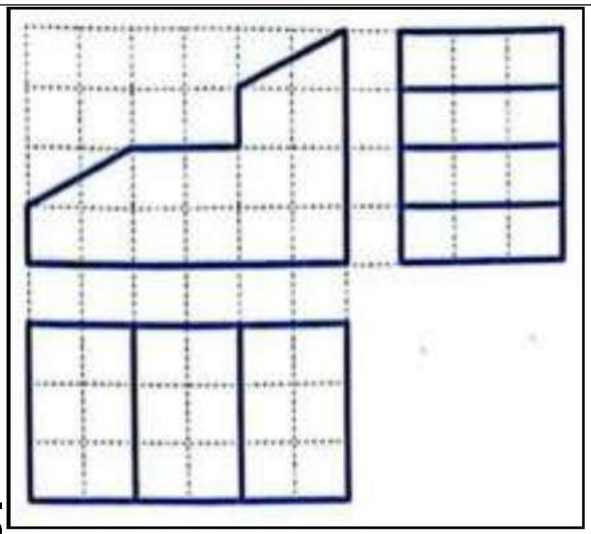
13



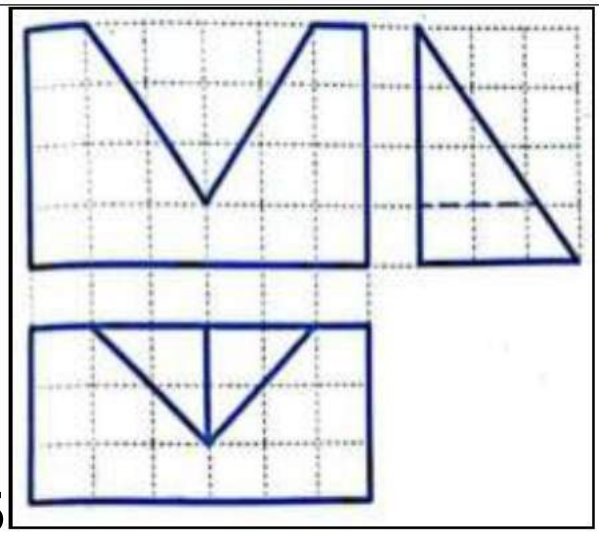
14



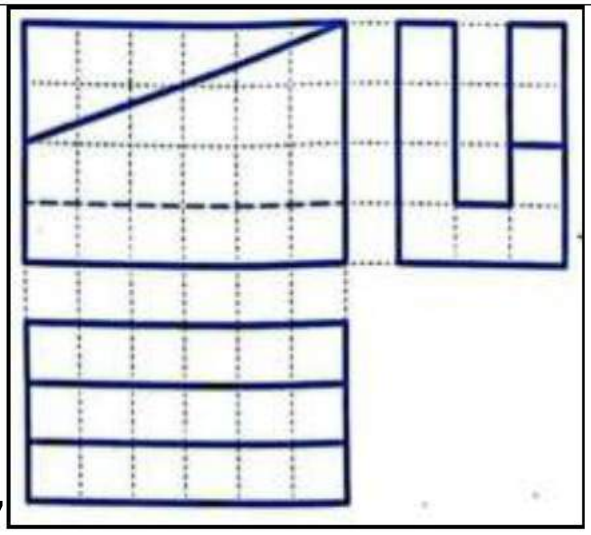
15



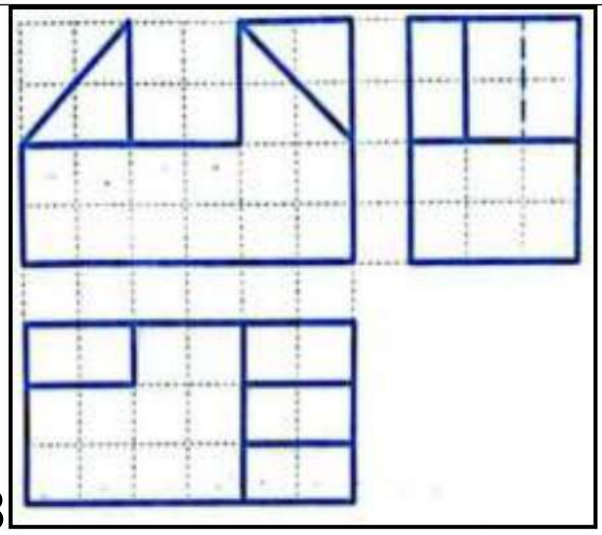
16



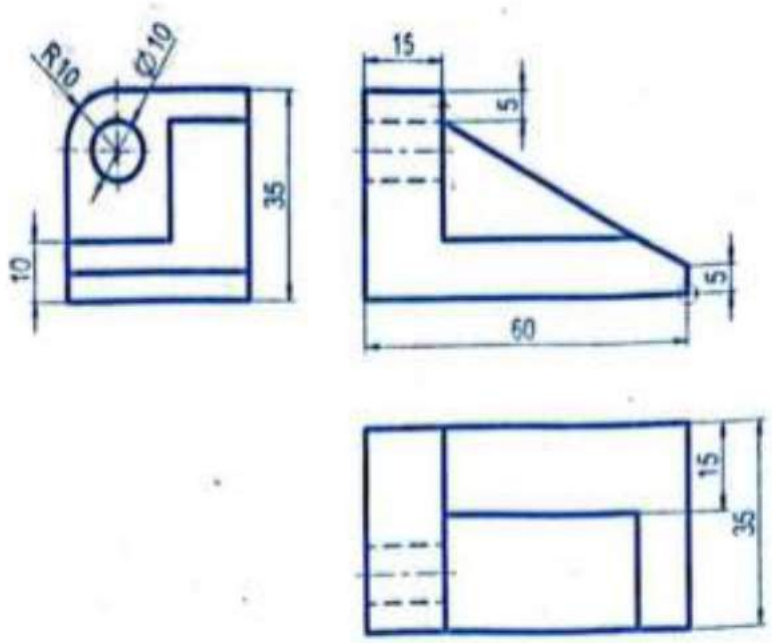
17



18

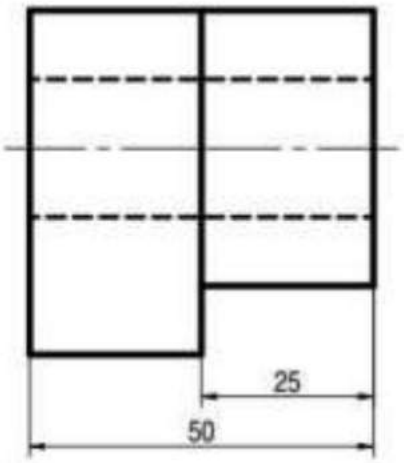


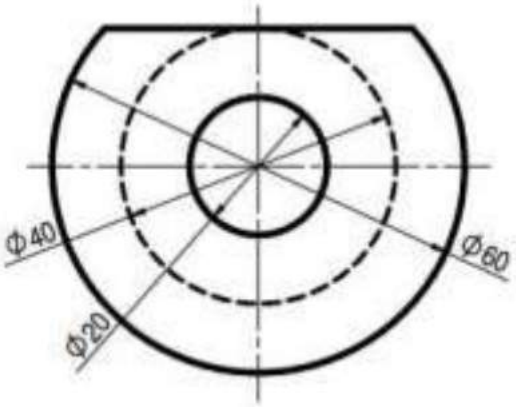
5.2. Draw an isometric drawing for the given views for the component shown:



TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

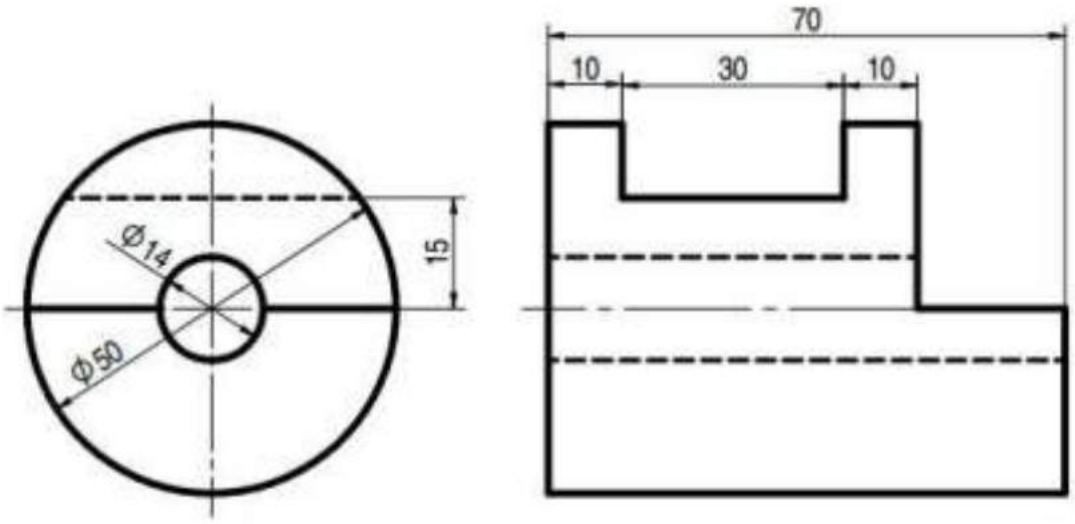
5.3. DRAW AN ISOMETRIC DRAWING FOR THE GIVEN VIEWS FOR THE COMPONENT SHOWN:





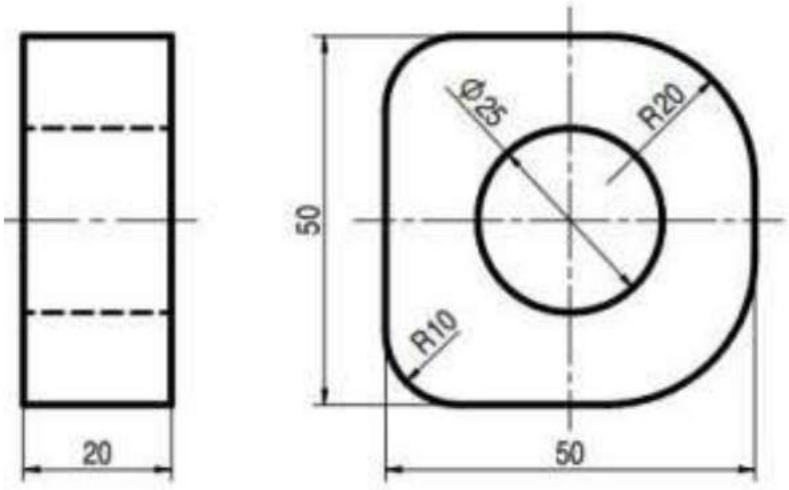
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

5.4. DRAW AN ISOMETRIC DRAWING FOR THE GIVEN VIEWS FOR THE COMPONENT SHOWN:



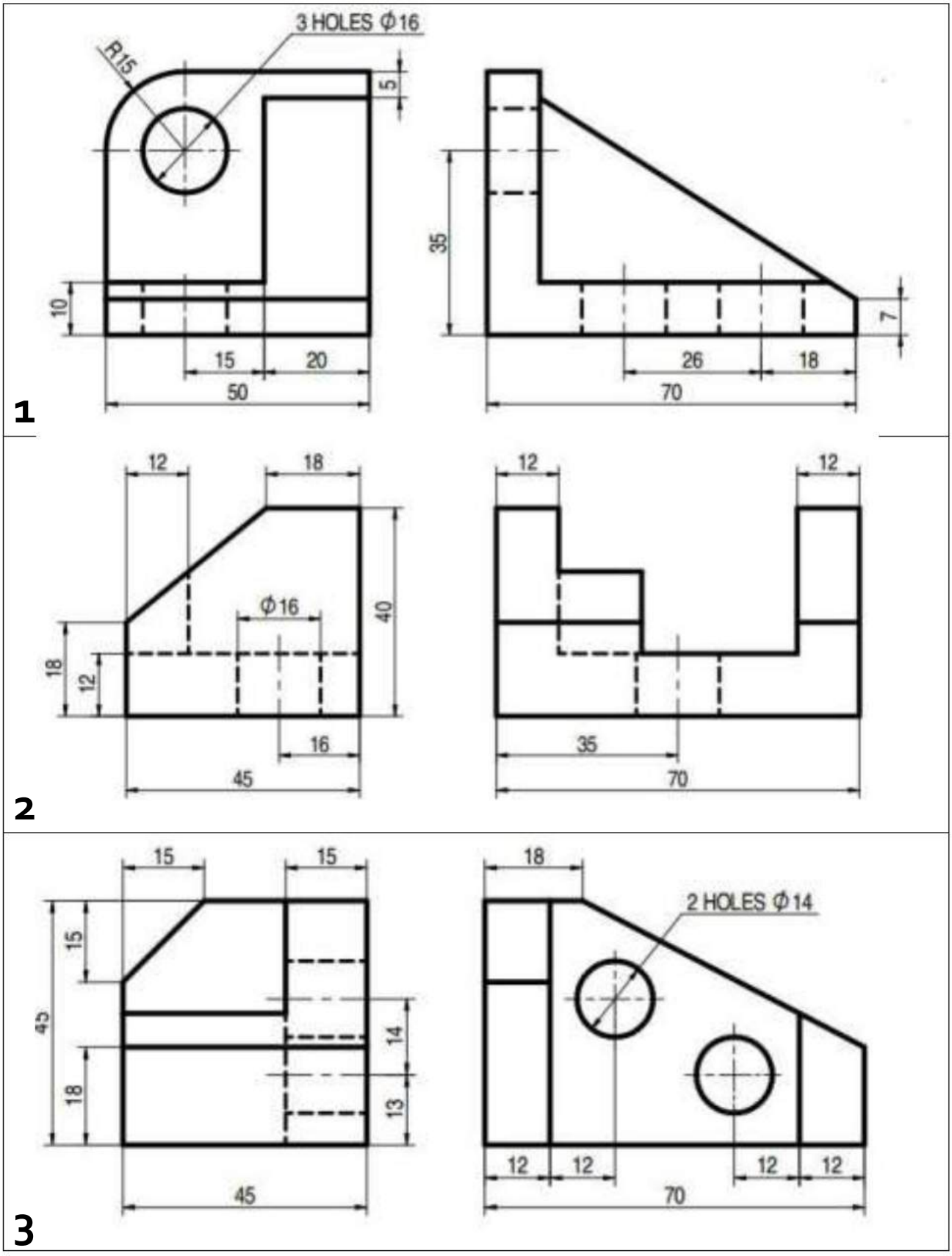
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

5.5. Draw an isometric drawing for the given views for the component shown:



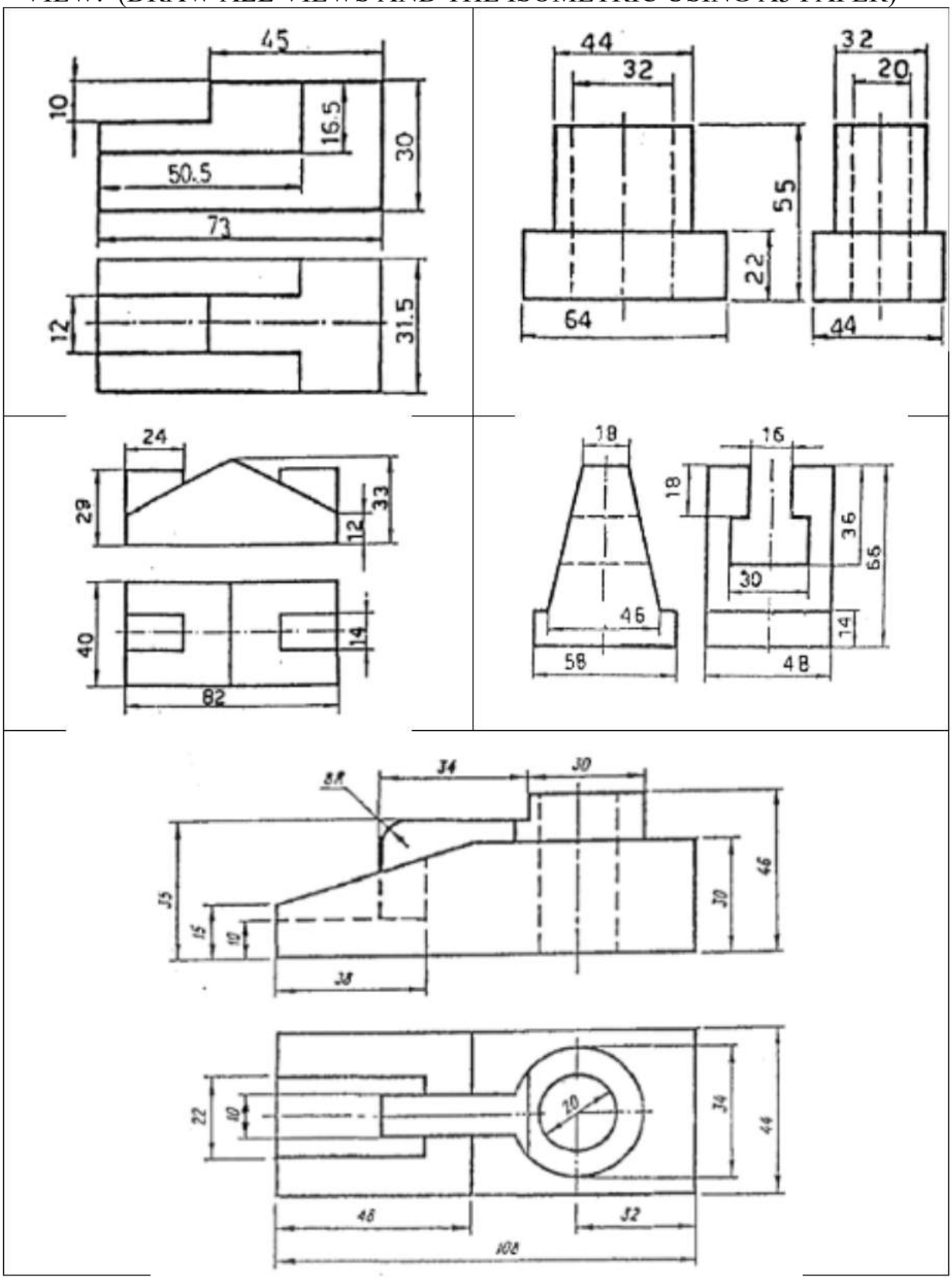
TITLE	SEC.	NAME	ST.NO.	DATE	NO.
				SCALE	

5.6. Draw an isometric drawing for the given views for the component shown:



CHAPTER 6 MISSING VIEWS

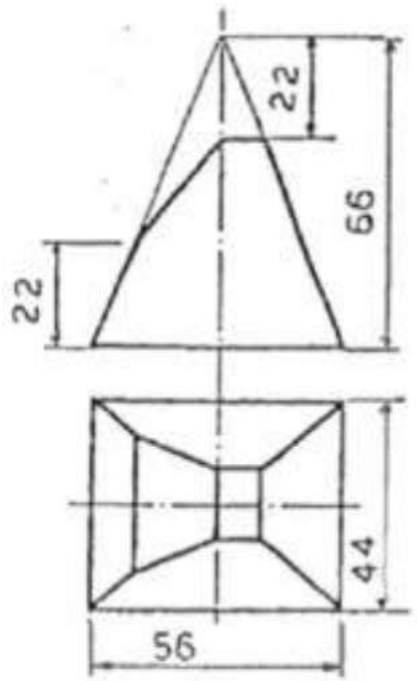
6.1. DEDUCE THE MISSING VIEW, HENCE DRAW THE ISOMETRIC DRAWING OF THE FOLLOWING FIGURES IN FULL SCALE. DON'T DIMENSIONS ON THE VIEW. (DRAW ALL VIEWS AND THE ISOMETRIC USING A3 PAPER)



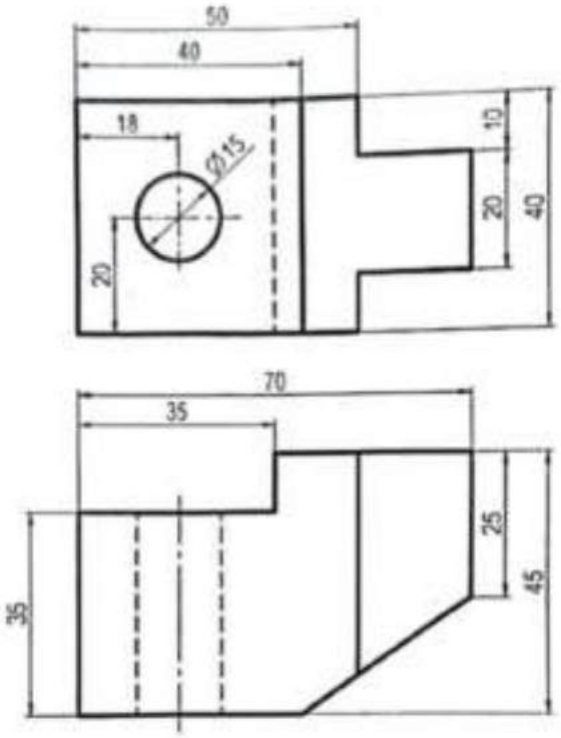
6.2.DEDUCE THE MISSING VIEW

Also, draw the isometric drawing of the following figures in full scale. Don't put dimensions on the view. (Draw all views and the isometric using A3 paper)

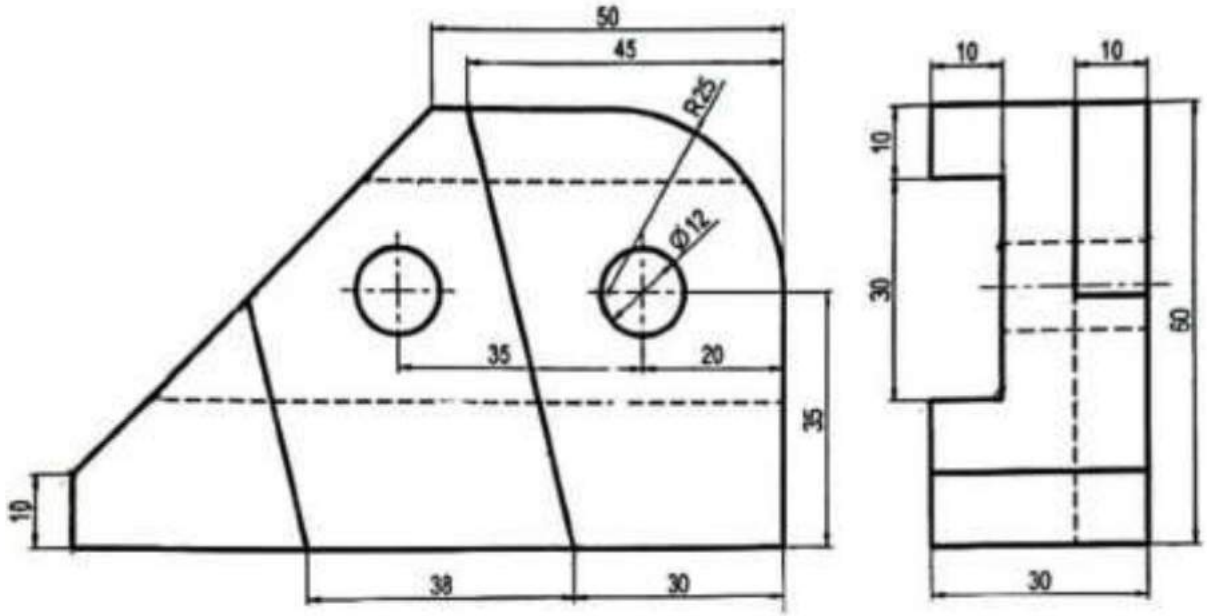
1



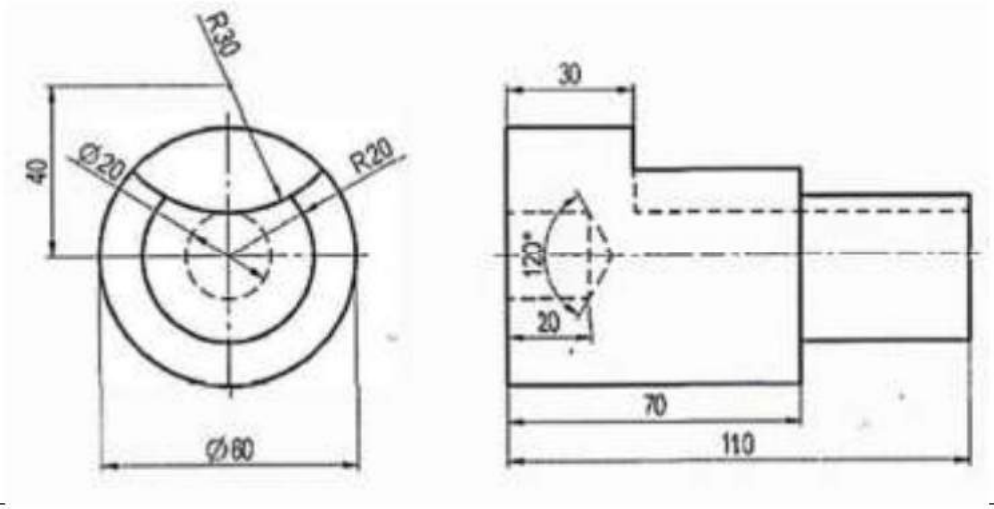
2



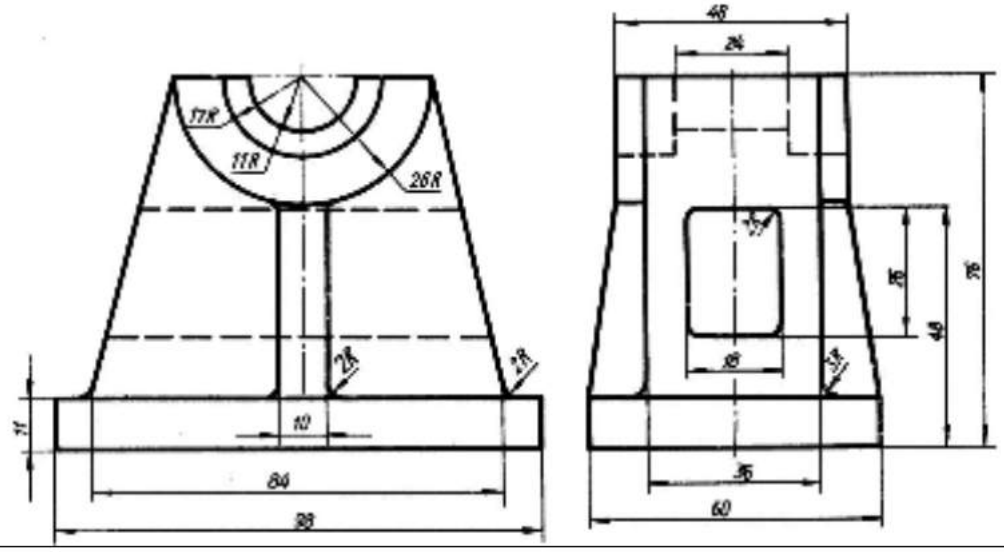
3



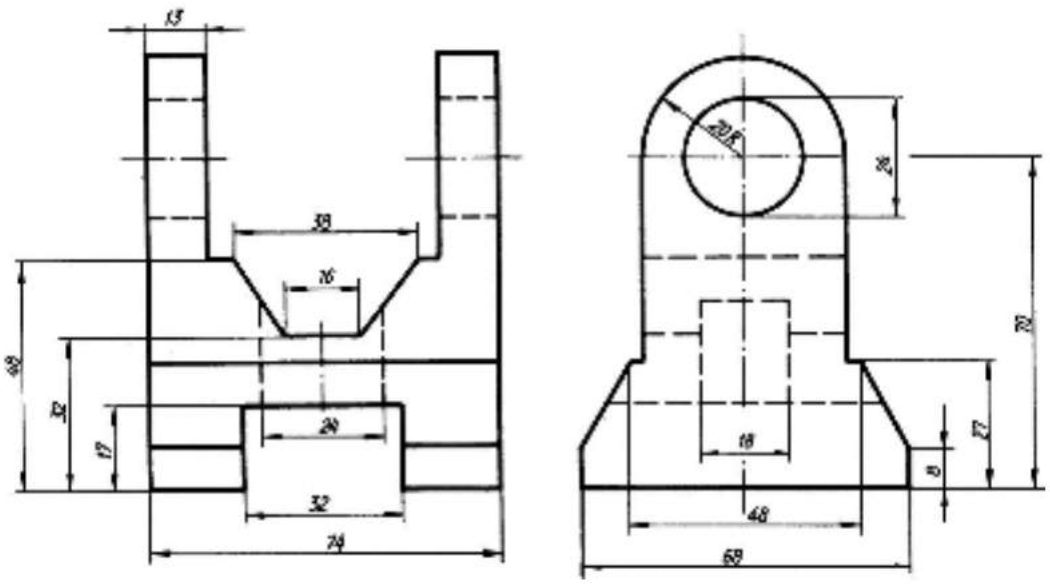
4



5

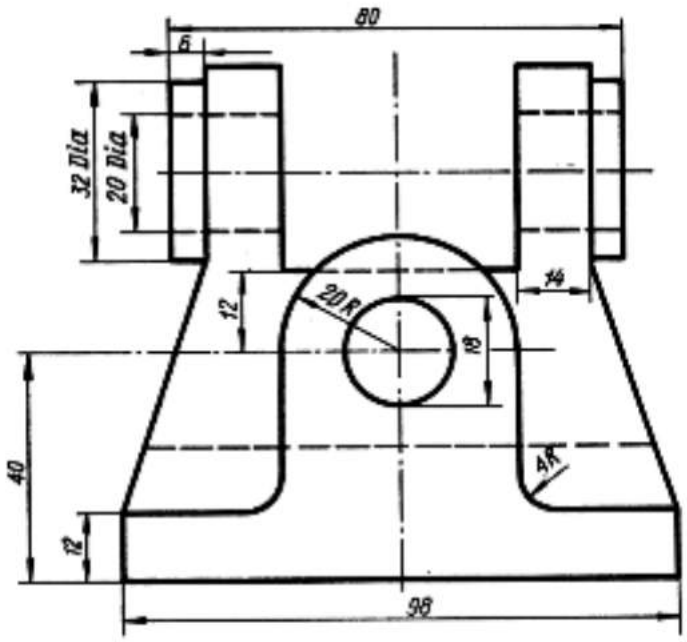


6

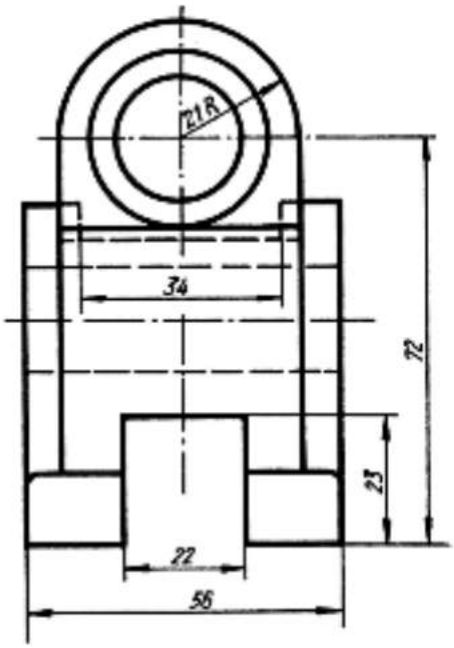


ELEVATION SIDE VIEW

7

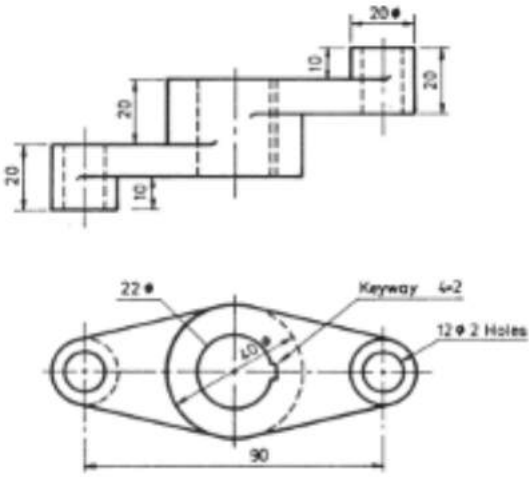


ELEVATION

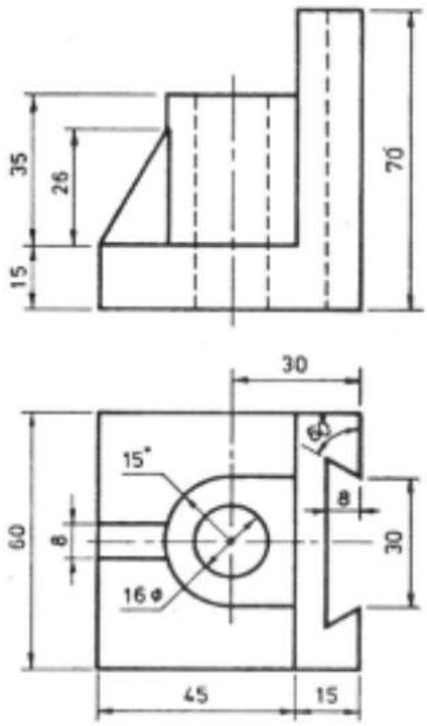


SIDE VIEW

8

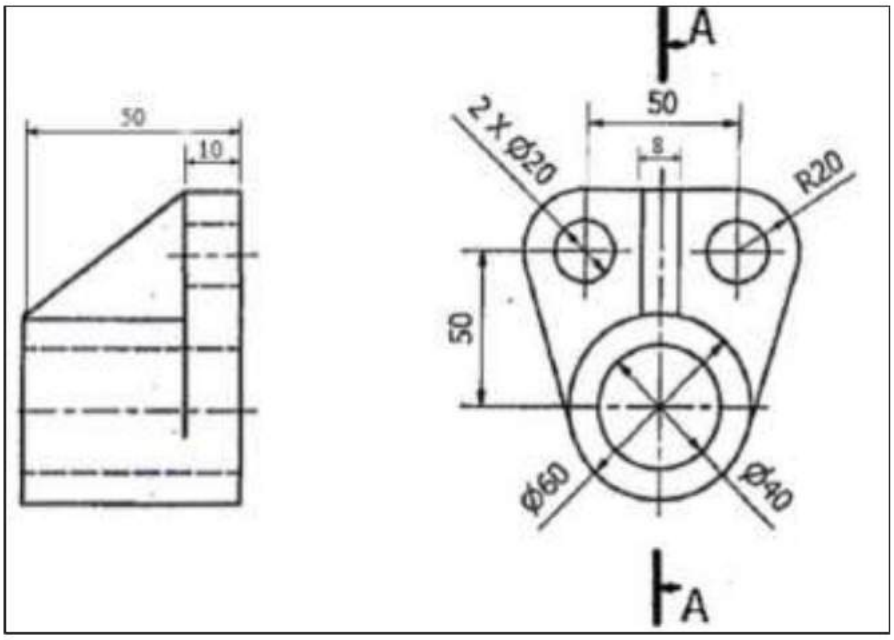


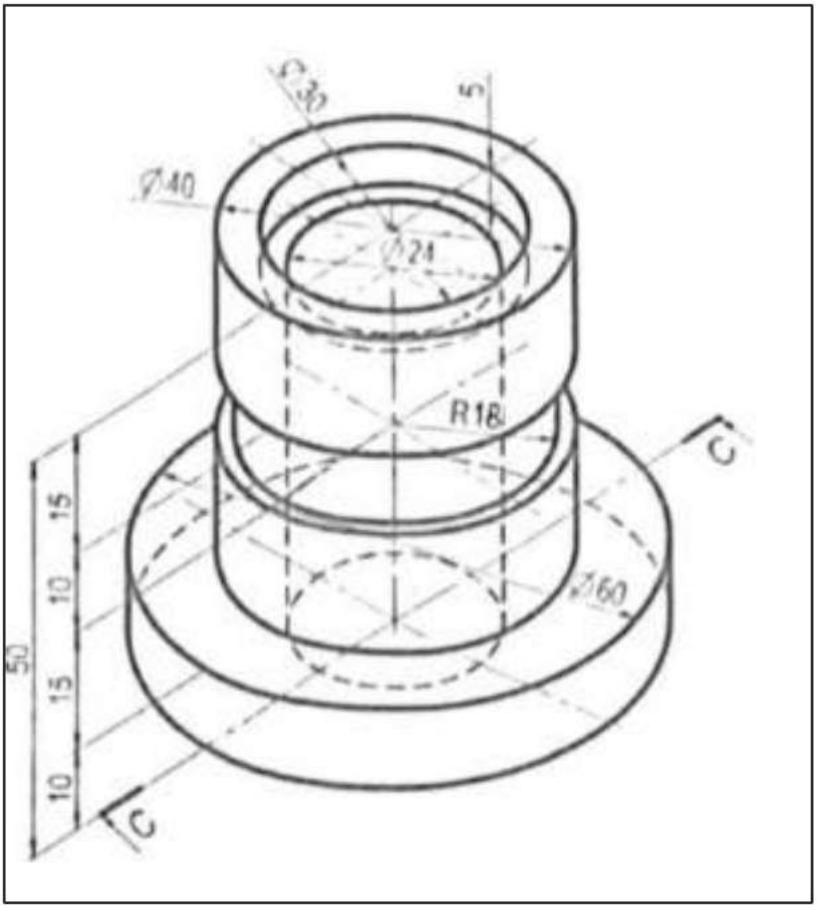
9

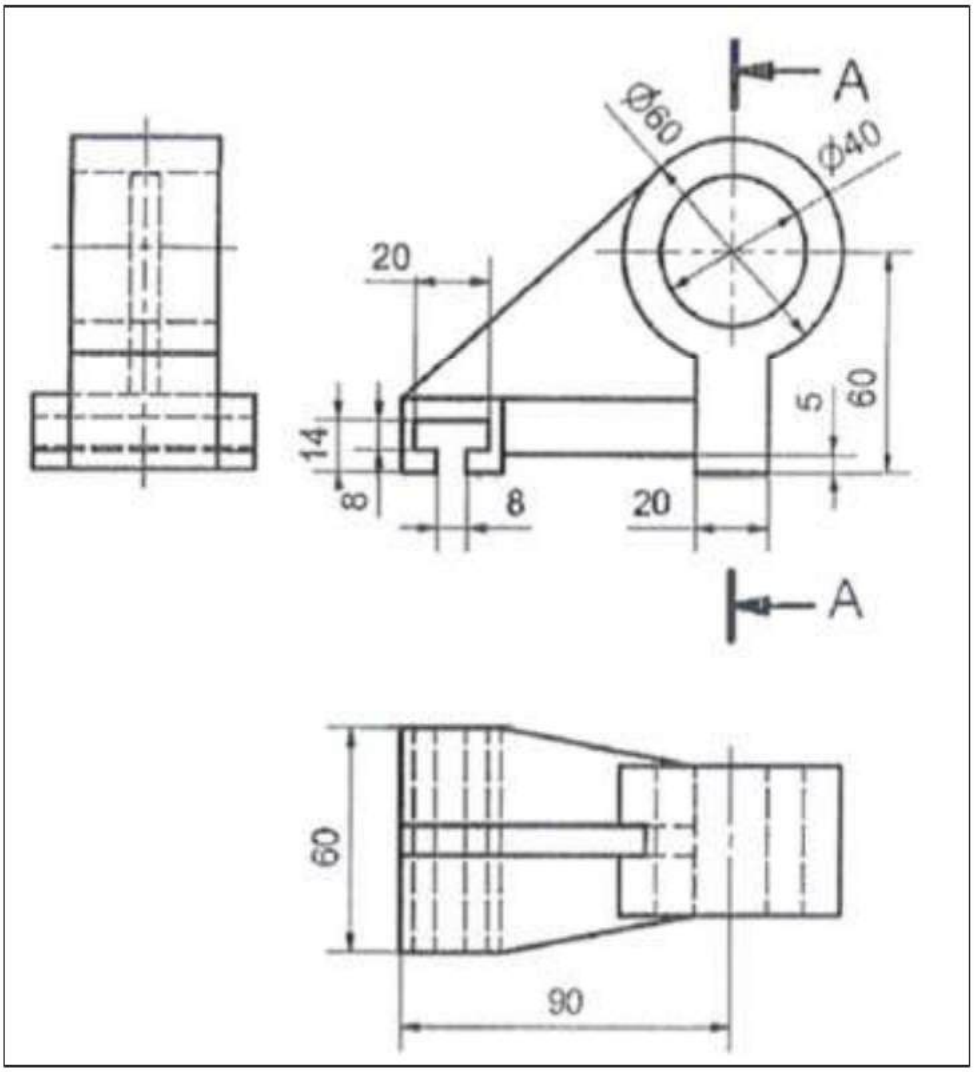


CHAPTER 7 SECTIONAL VIEWS

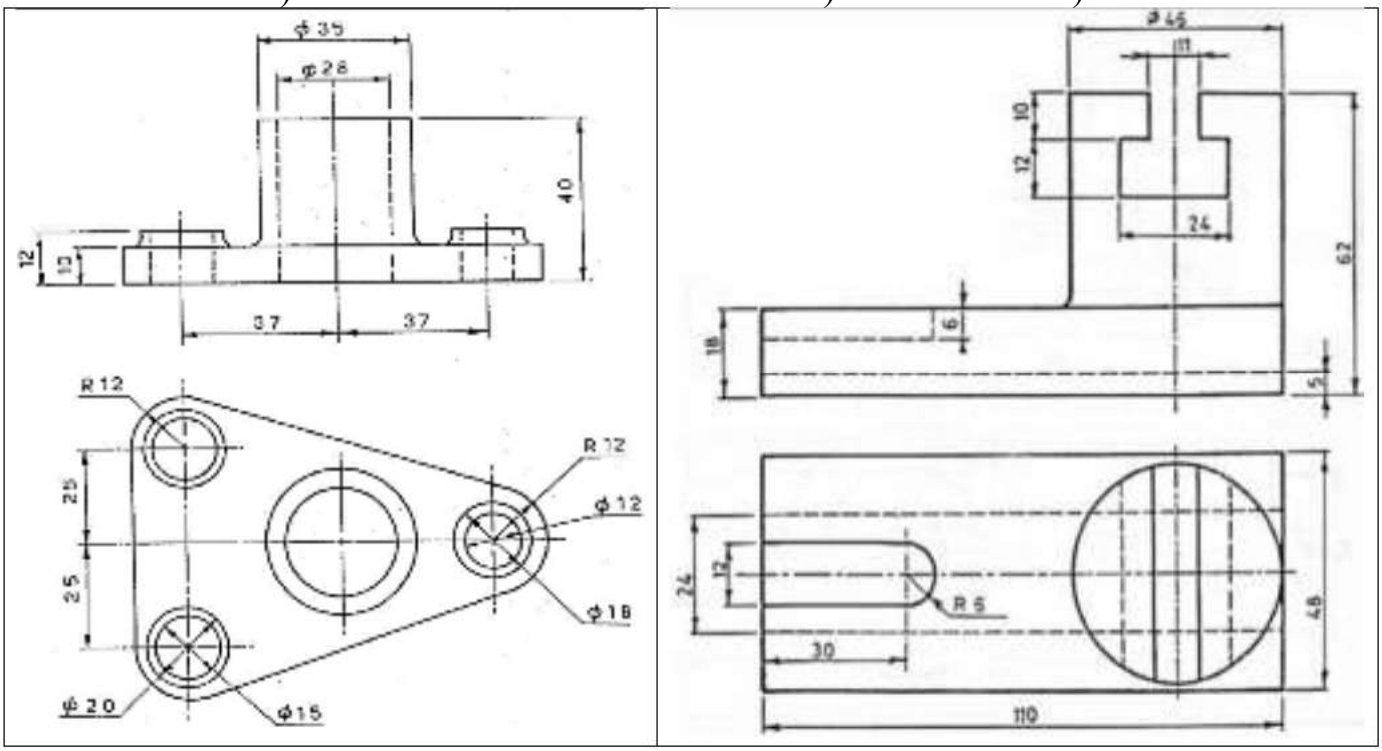
7.1. DRAW THE VIEWS AND SECTIONS AS INDICATED BELOW. PUT DIMENSIONS ON THE VIEWS

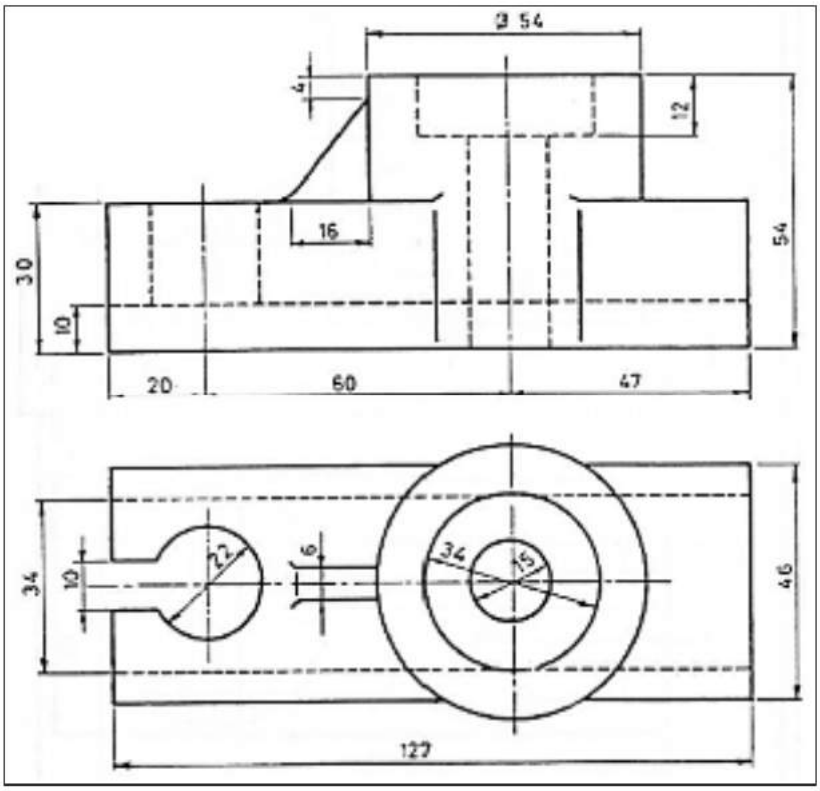




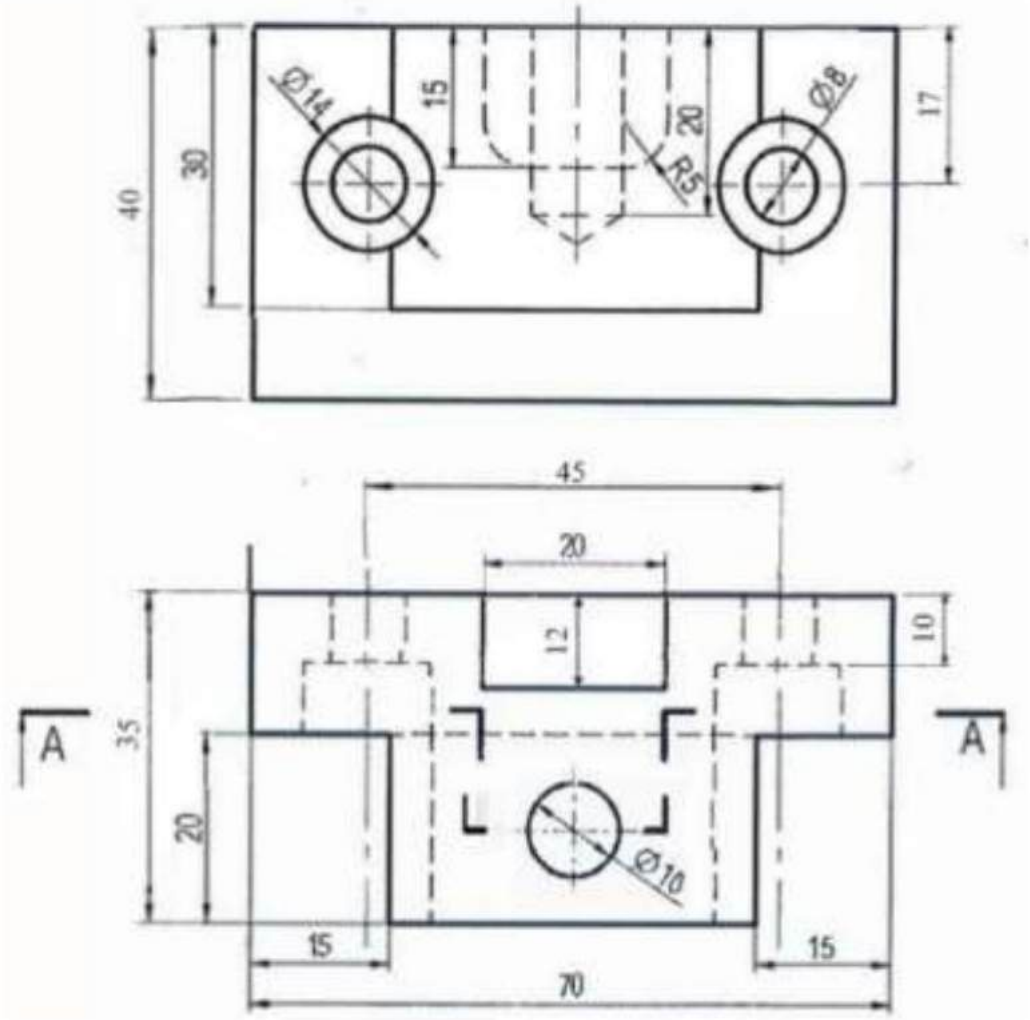

A
Ø60
Ø40
20
14
8
8
20
5
60
A
60
90

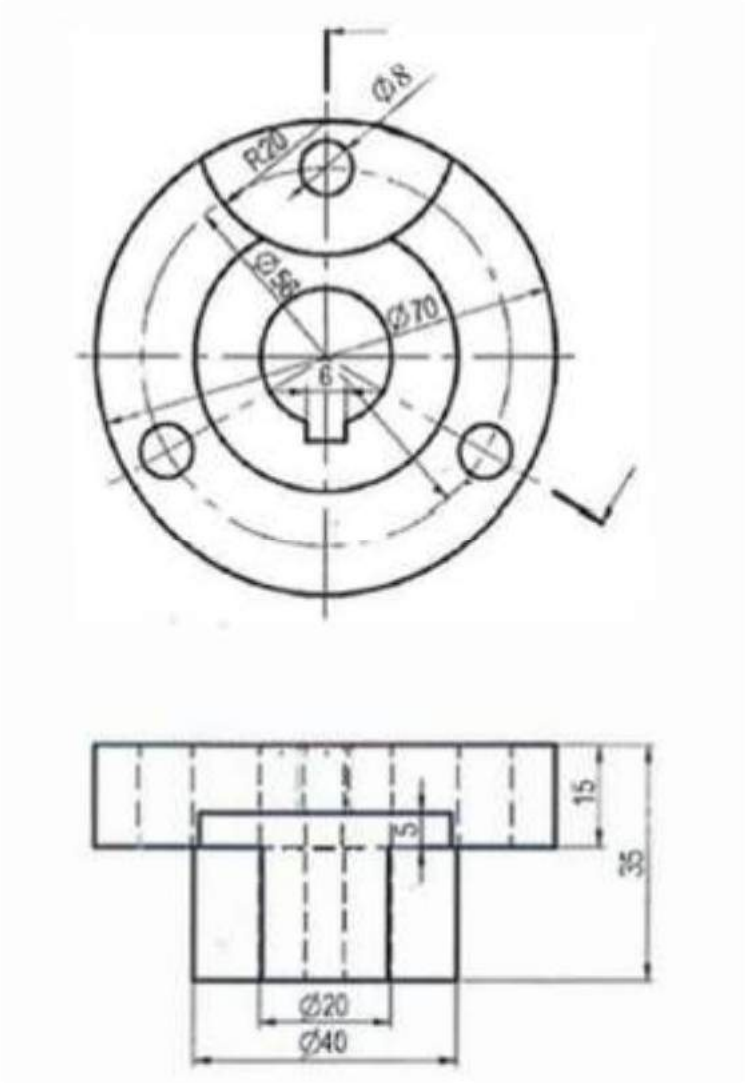
7.2.IN FIGURE THE FRONT ELEVATION AND PLAN ARE GIVEN. DRAW IN FULL SCALE: A) SECTIONAL ELEVATION B) SIDE VIEW C) COMPLETE PLAN





7.3. DRAW THE VIEWS IN SECTION AS INDICATED ON THE FOLLOWING COMPONENTS



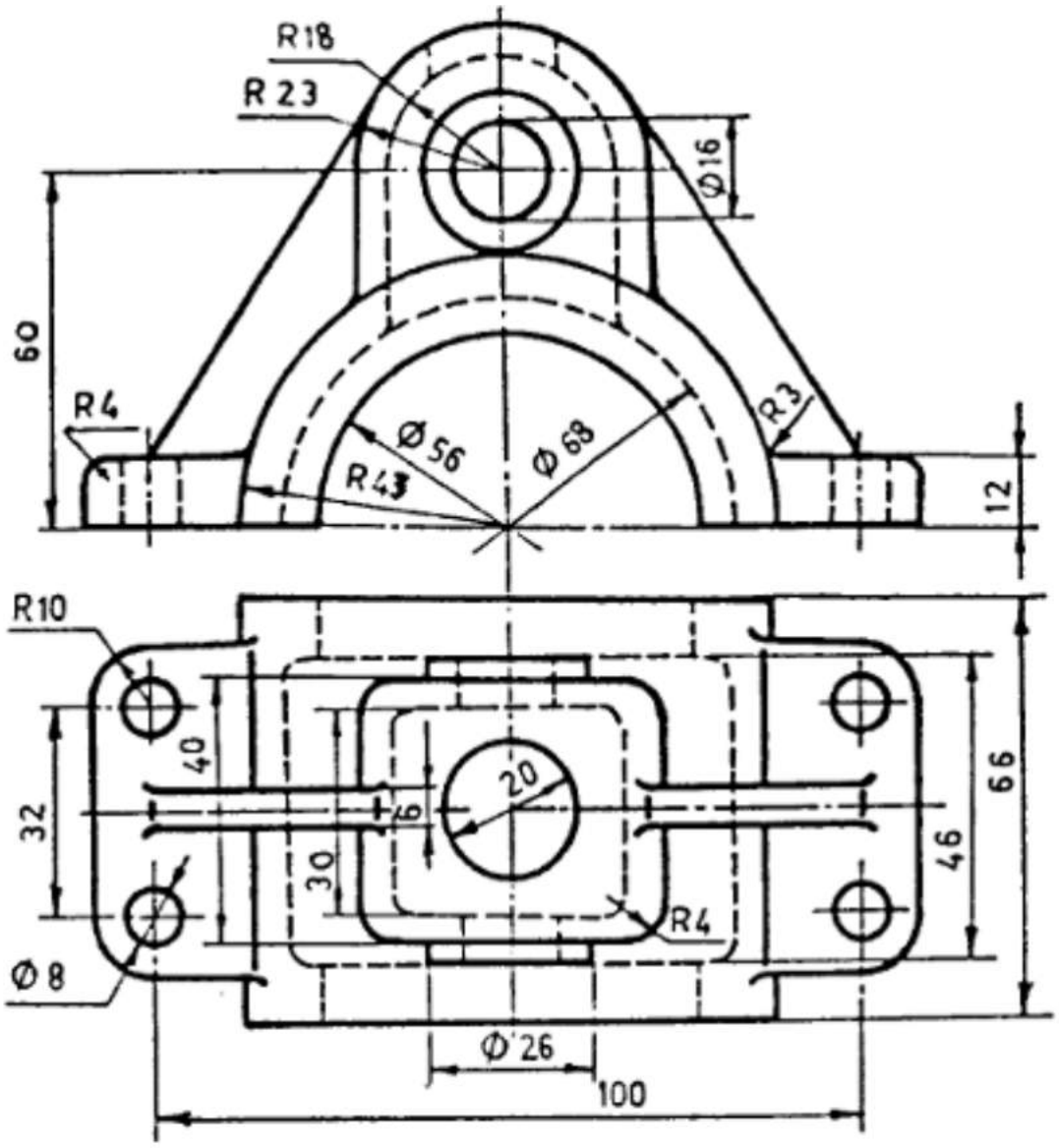

Ø8
R20
Ø56
Ø70
6
15
5
35
Ø20
Ø40

7.4. DRAW TO FULL SCALE THE FOLLOWING:

a) Half Sectional Elevation.

b) Half Sectional Side View.

c) Complete Plan.

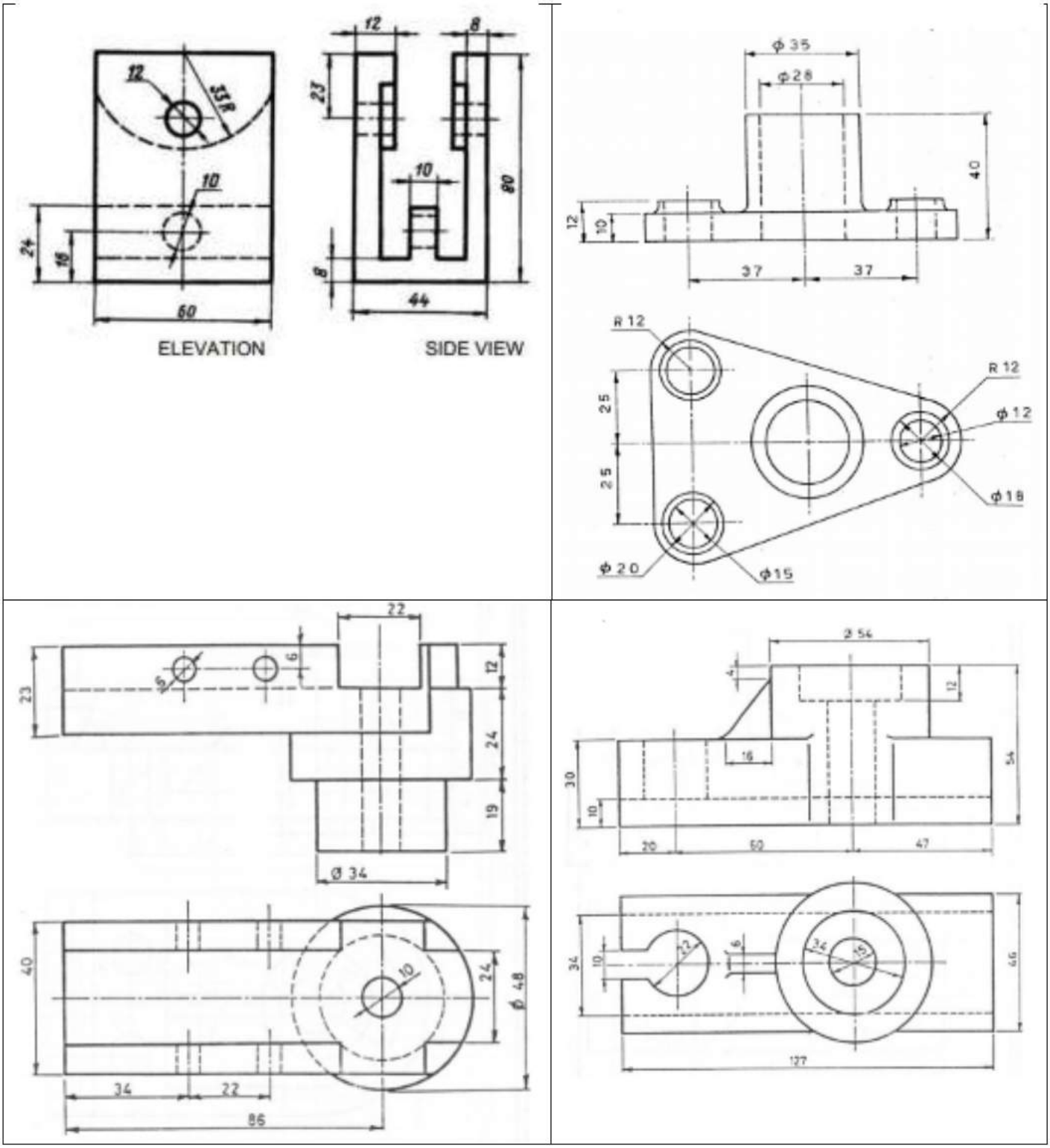


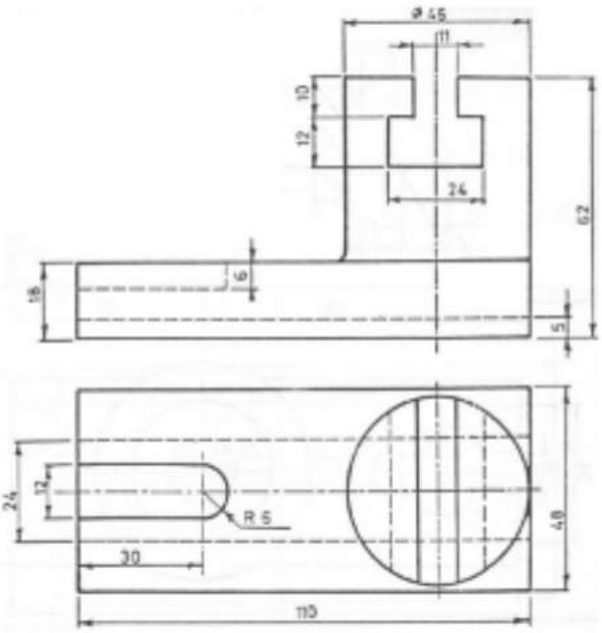
7.5.For the following given front elevation and side, draw to full scale the following:

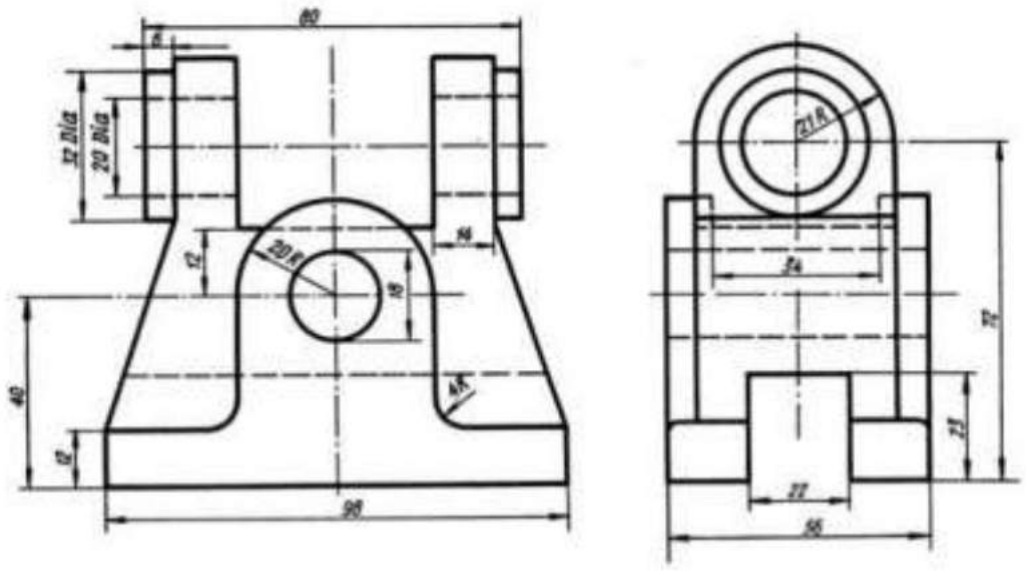
a) Sectional Elevation

b) Side View

c) Complete Plan

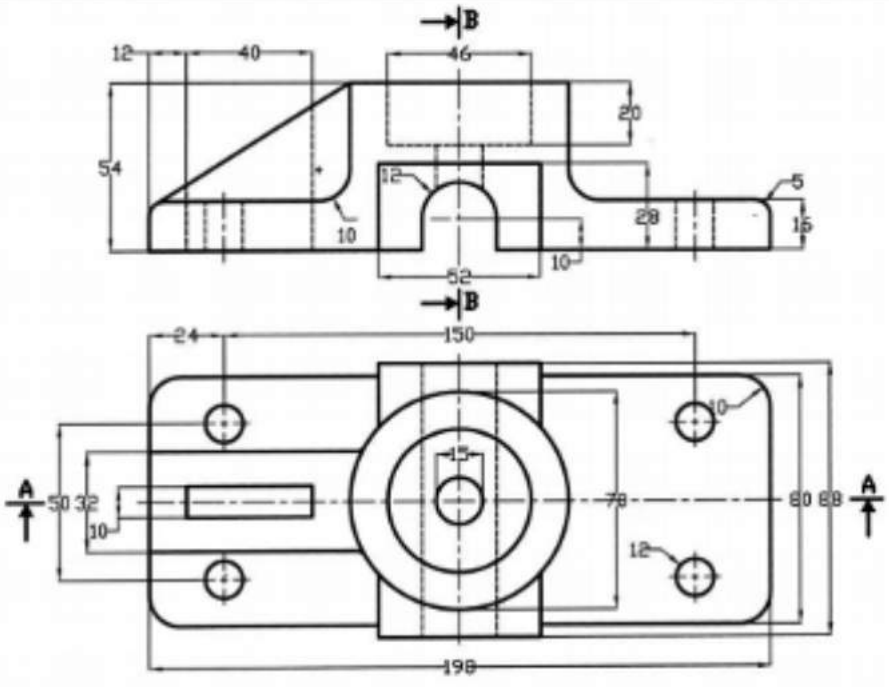


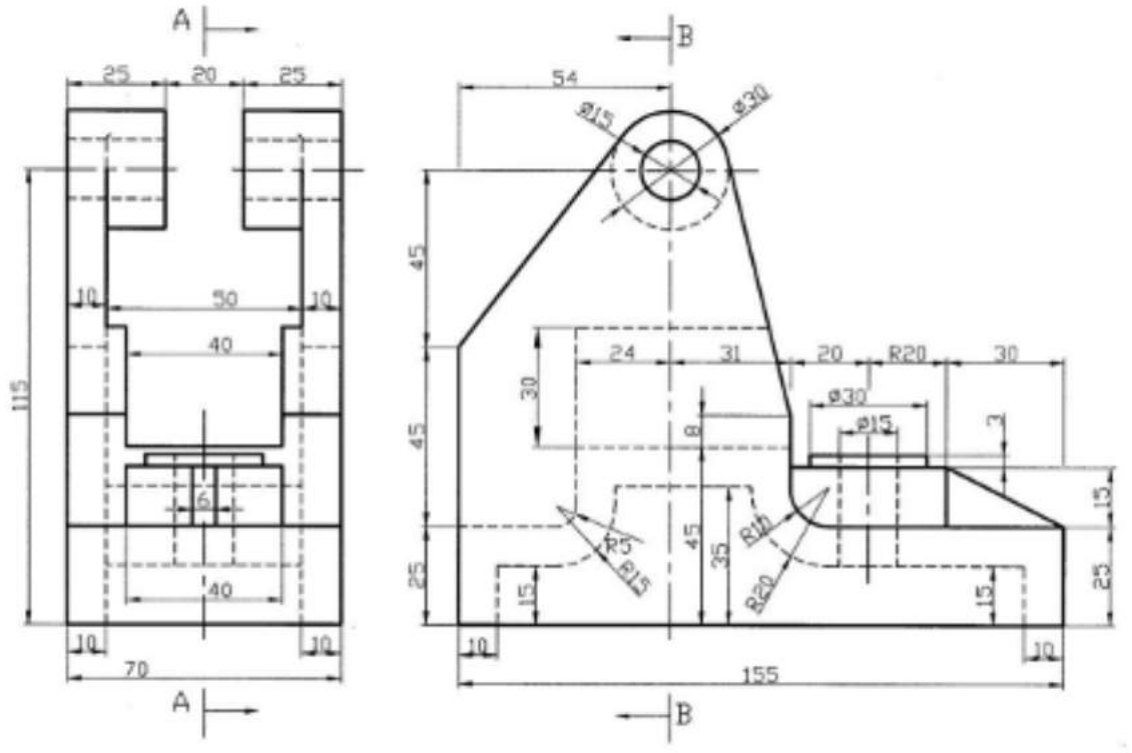


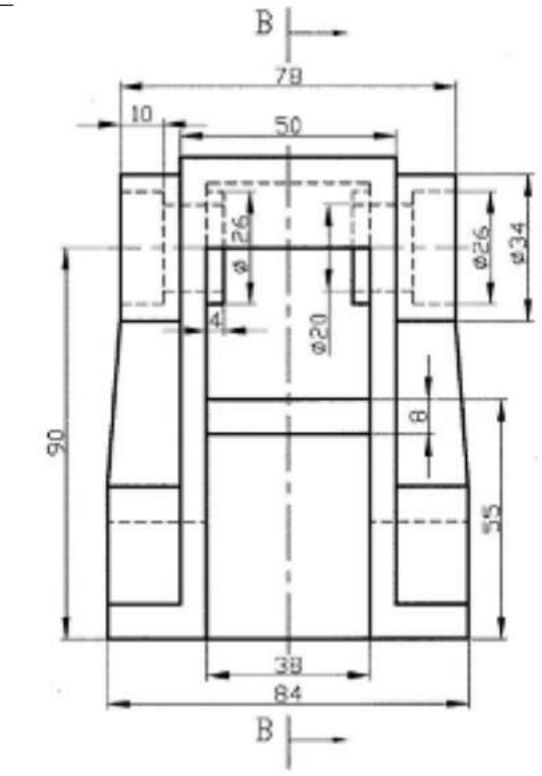


ELEVATION SIDE VIEW

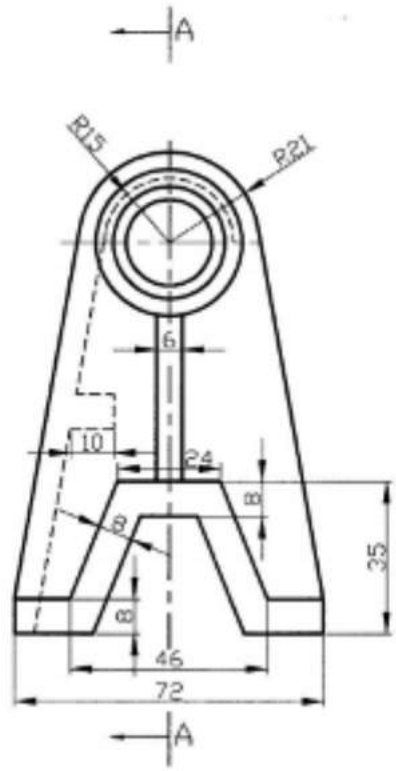
7.6.IN FIGURE THE FRONT ELEVATION AND PLAN ARE GIVEN.
DRAW IN FULL SCALE:
A) SECTIONAL ELEVATION AT A-A
B) SECTIONAL SIDE VIEW AT B-B
C) COMPLETE PLAN



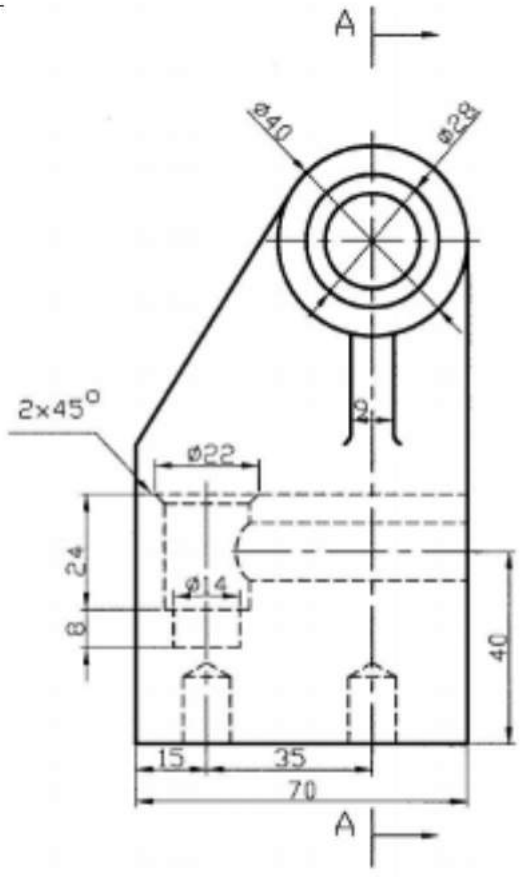




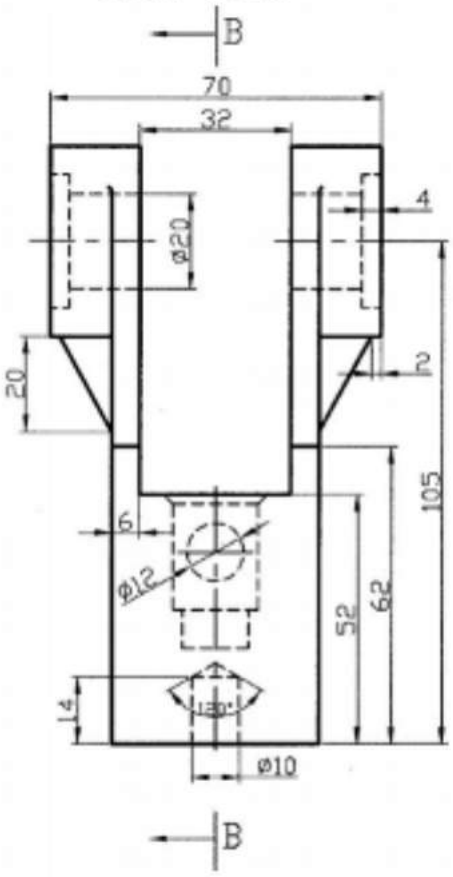
ELEVATION



SIDE VIEW



SIDE VIEW



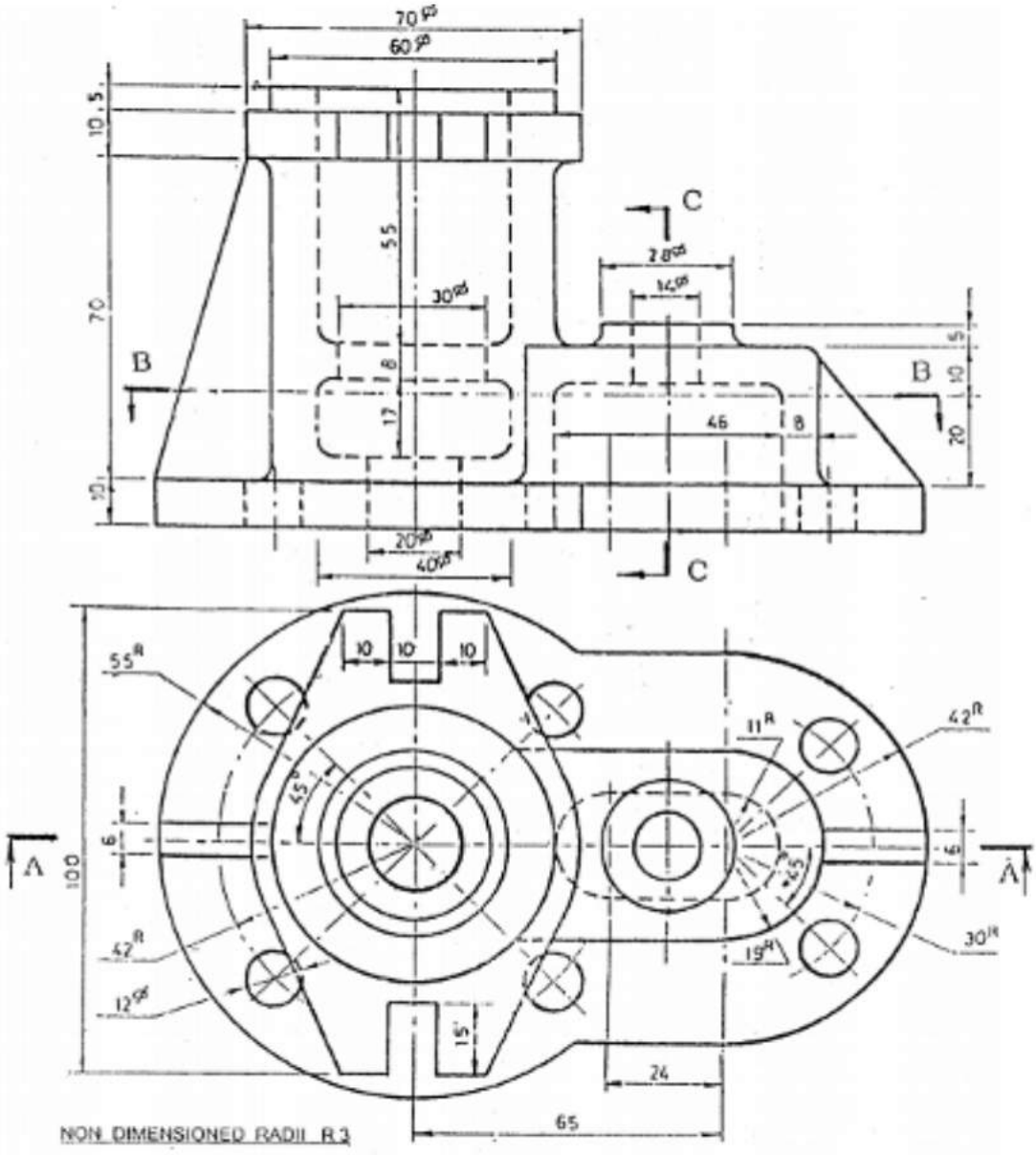
ELEVATION

7.7.DRAW TO FULL SCALE THE FOLLOWING:

A) SECTIONAL ELEVATION A-A.

B) SECTIONAL PLAN B-B.

C) SECTIONAL SIDE VIEW C-C.

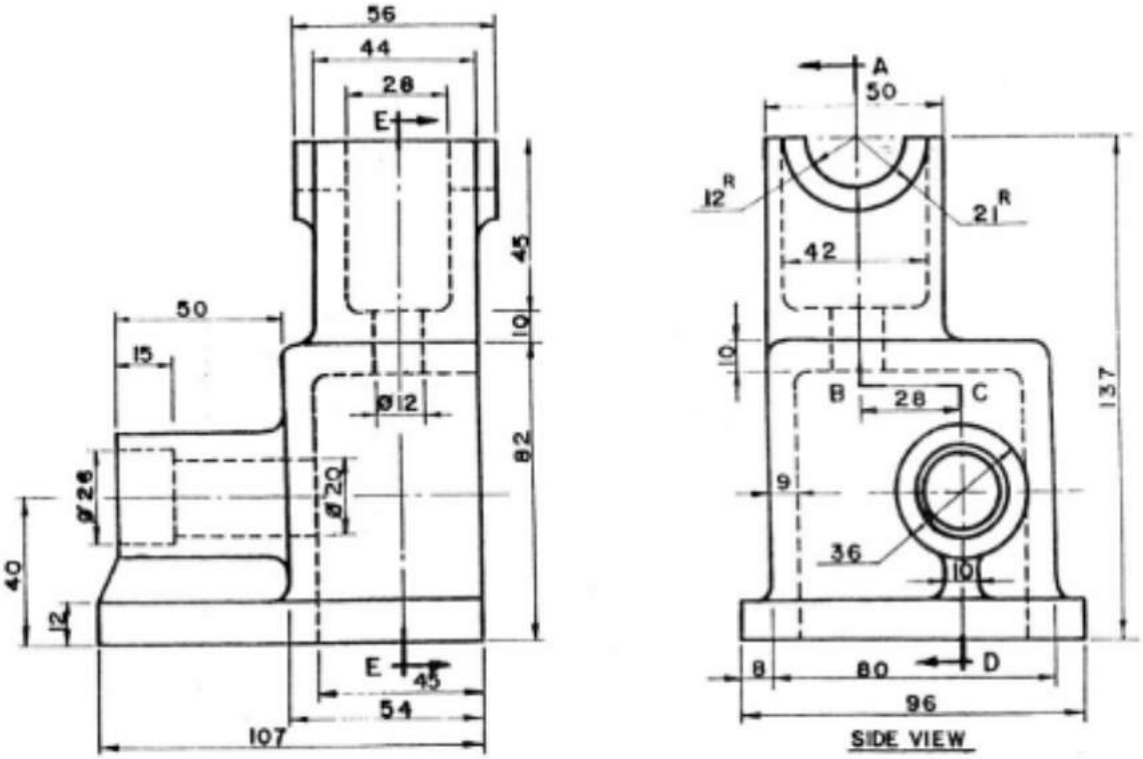


7.8. DRAW TO FULL SCALE THE FOLLOWING:

A) SECTIONAL ELEVATION AT A-B-C-D.

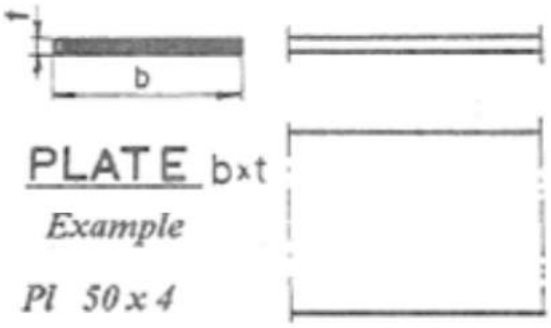
B) SECTIONAL SIDE VIEW AT E-E.

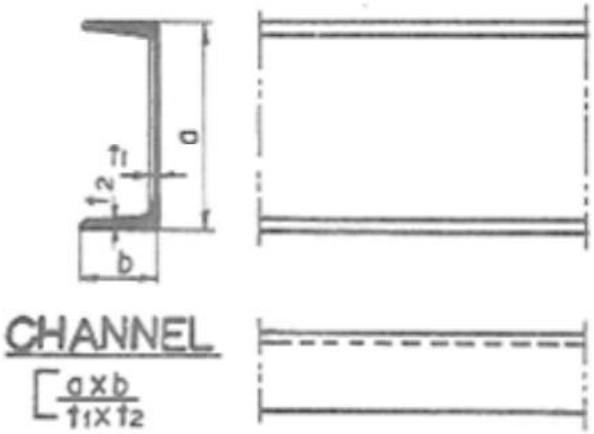
C) COMPLETE PLAN

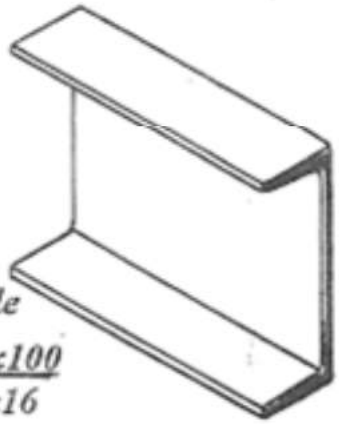


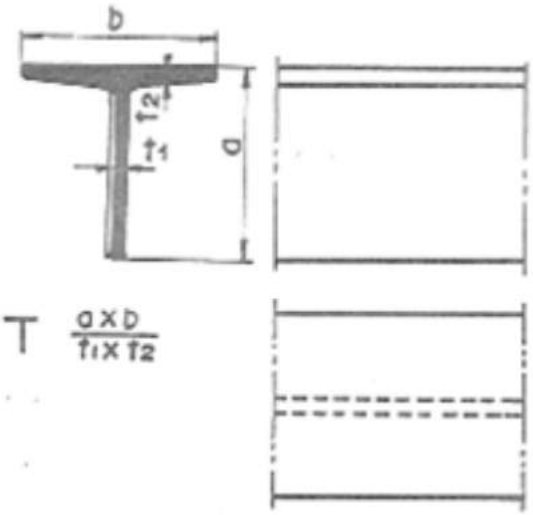
CHAPTER 8 STEEL CONSTUCTION

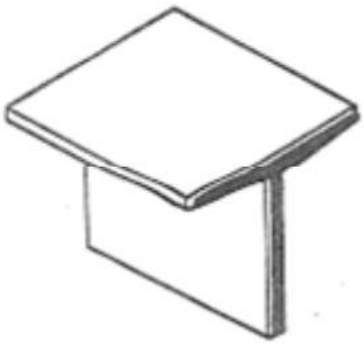
Symbols And Conventions Of Steel Sections.



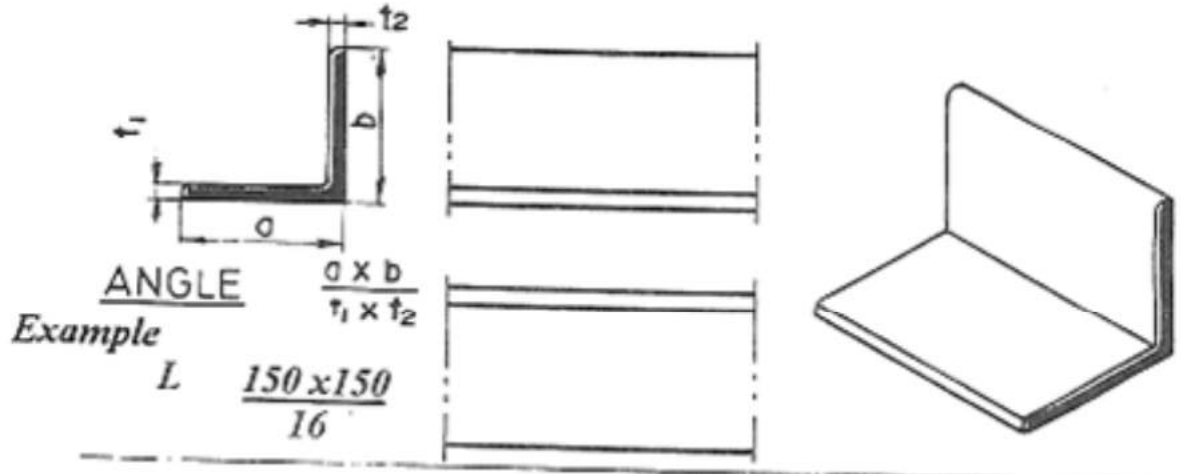








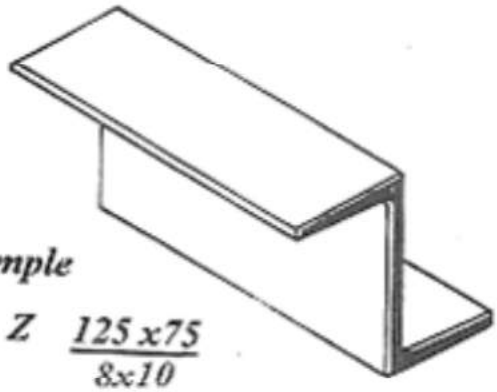
Example T $\frac{125 \times 125}{10}$

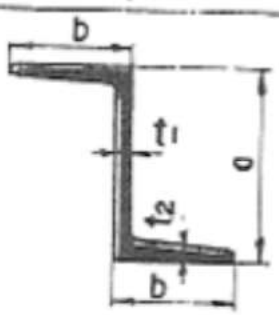


ANGLE $\frac{a \times b}{t_1 \times t_2}$

Example

L $\frac{150 \times 150}{16}$

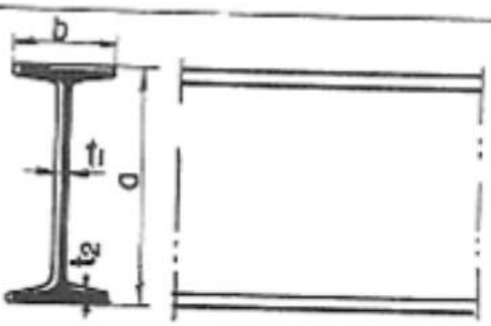




$\frac{a \times b}{t_1 \times t_2}$

Example

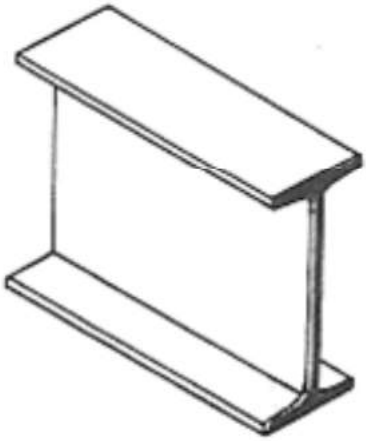
Z $\frac{125 \times 75}{8 \times 10}$



I $\frac{a \times b}{t_1 \times t_2}$

Example

I $\frac{300 \times 125}{11 \times 16}$



COMPOUND SECTIONS

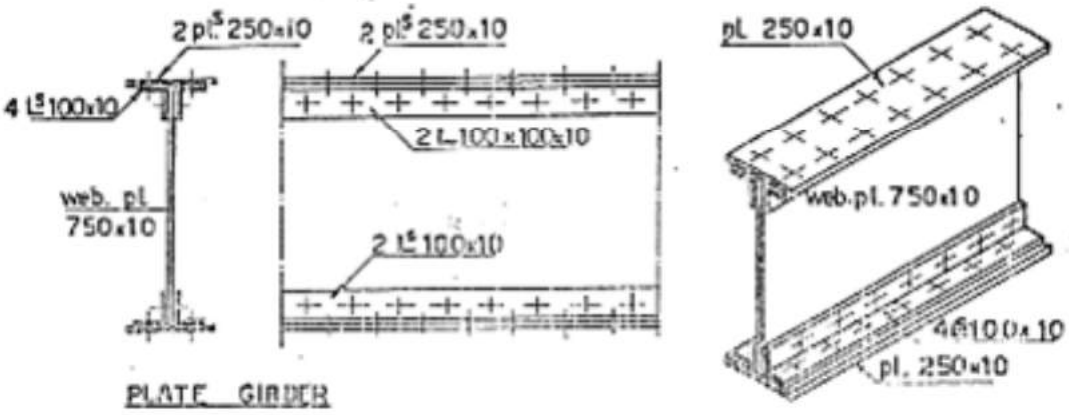
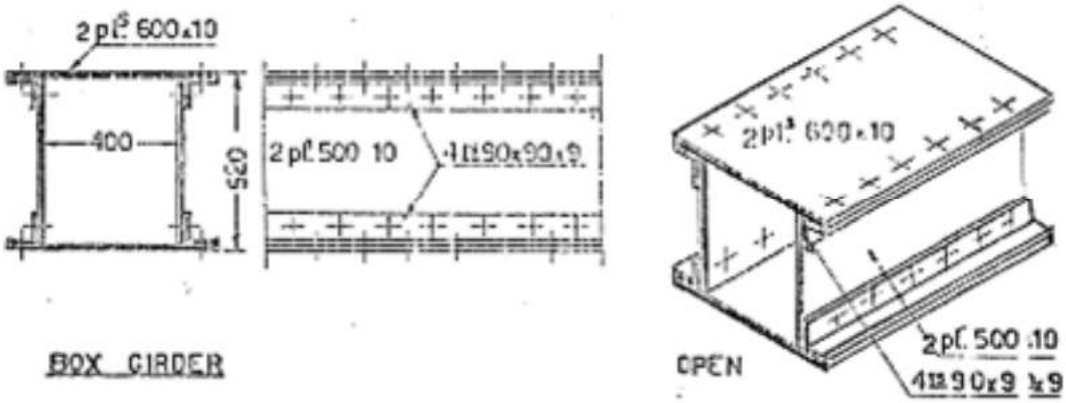
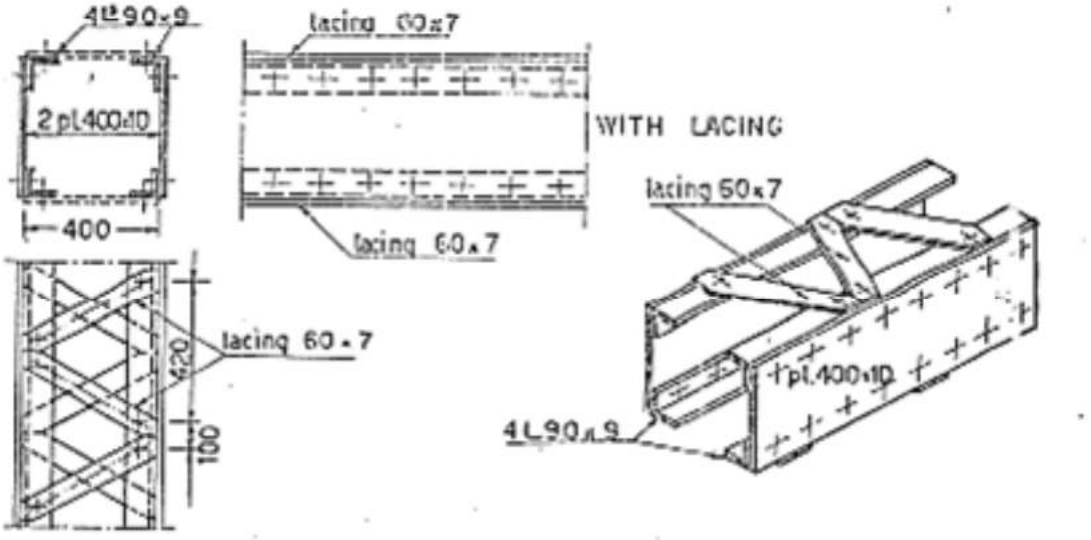


PLATE GIRDER



BOX GIRDER

OPEN



Examples of Angles and Plates Connections.

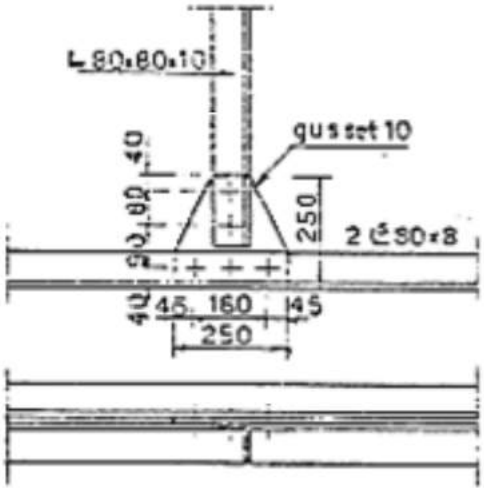
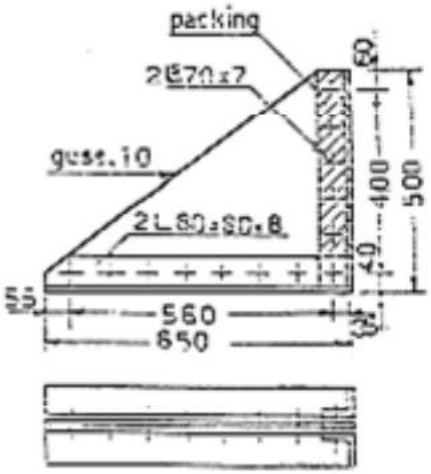
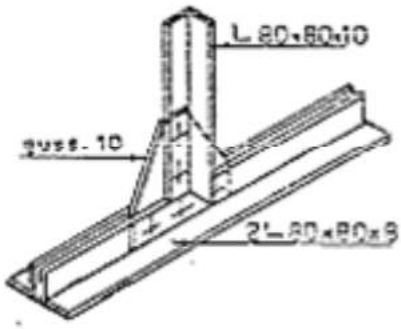


FIG. 1





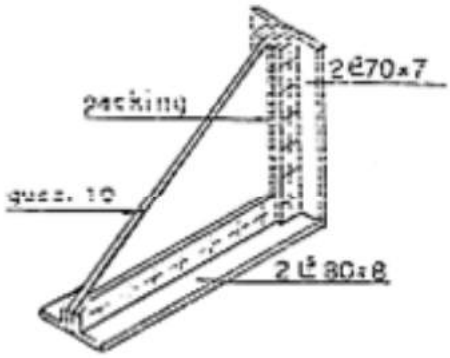
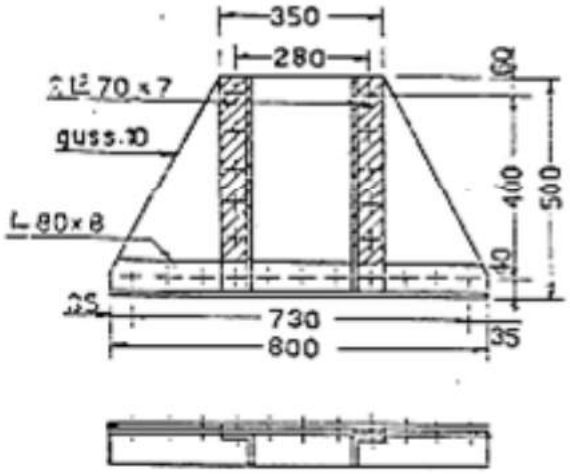


FIG. 2



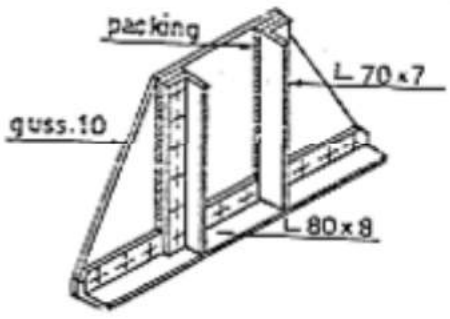


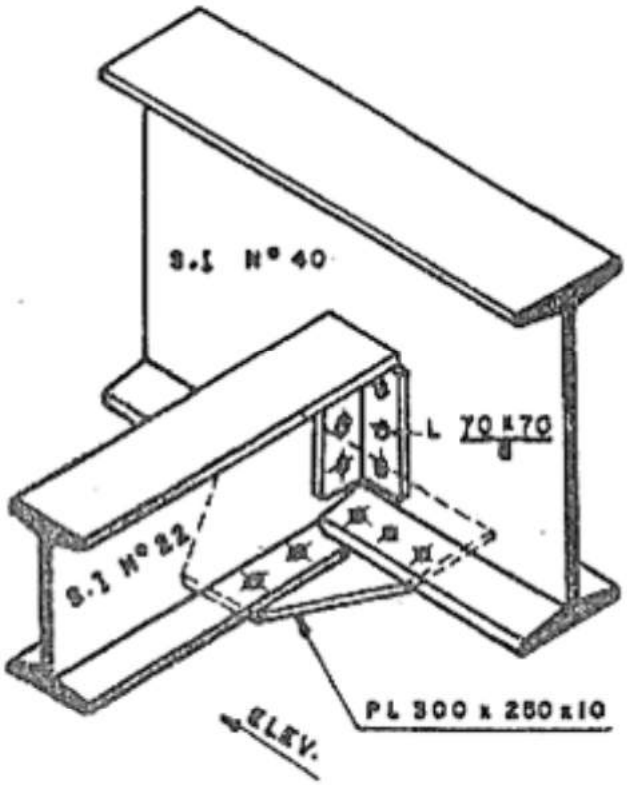
FIG. 3

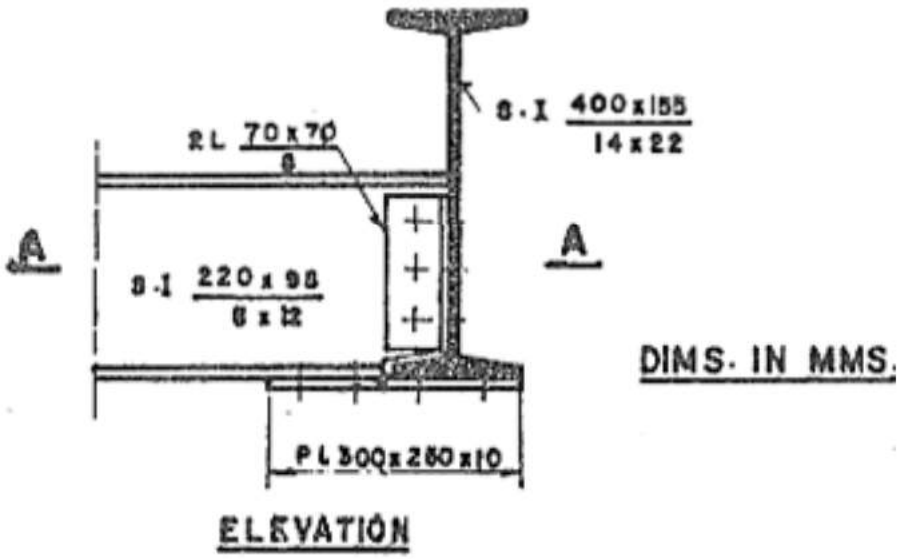
8.1. GIVEN THE ISOMETRIC AND THE FRONT ELEVATION VIEWS. IT IS REQUIRED TO DRAW IN A SCALE OF 1:5 THE FOLLOWING VIEWS:

A) ELEVATION

B) PLAN IN SECTIONAL VIEW A-A

C) SIDE VIEW





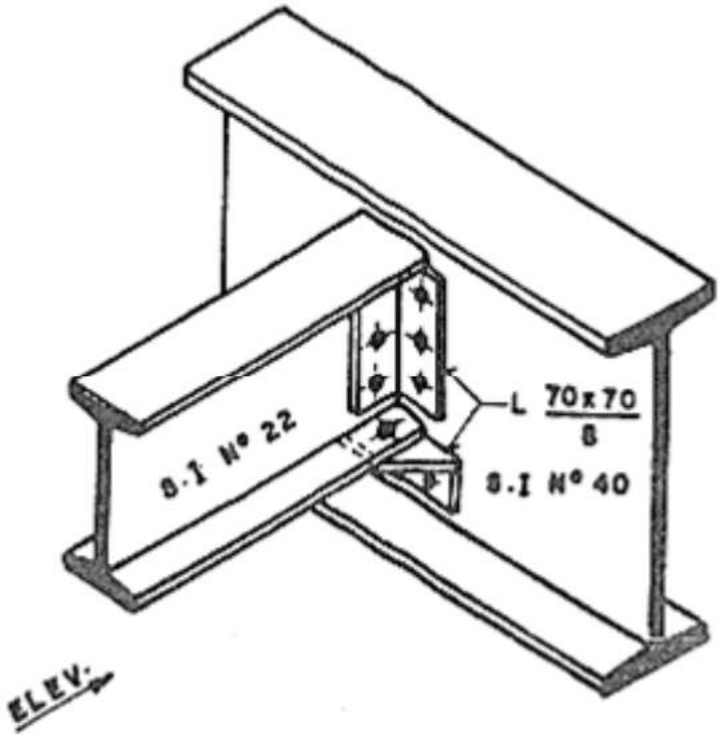
ELEVATION

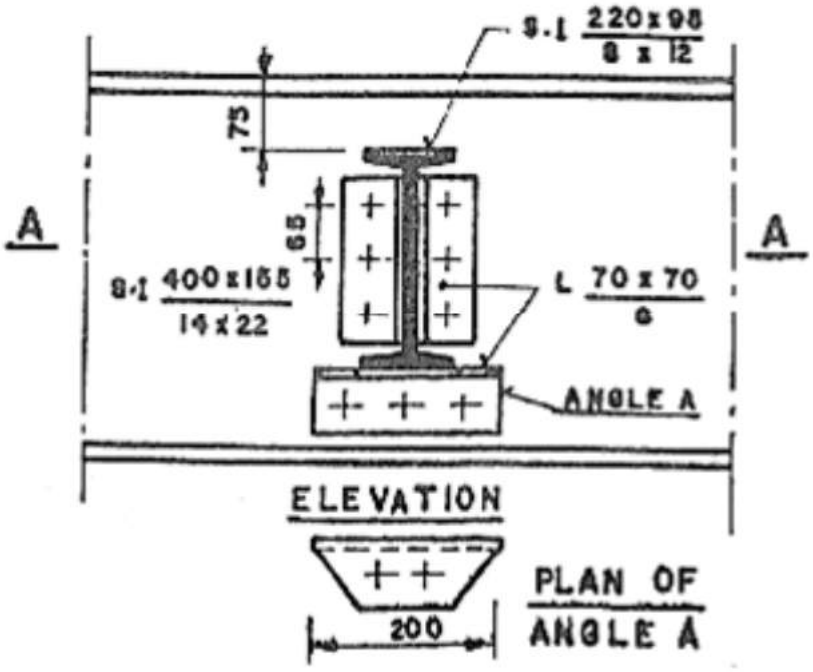
8.2. GIVEN THE ISOMETRIC AND THE FRONT ELEVATION VIEWS. IT IS REQUIRED TO DRAW IN A SCALE OF 1:5 THE FOLLOWING VIEWS:

A) ELEVATION

B) PLAN IN SECTIONAL VIEW A-A

C) SIDE VIEW



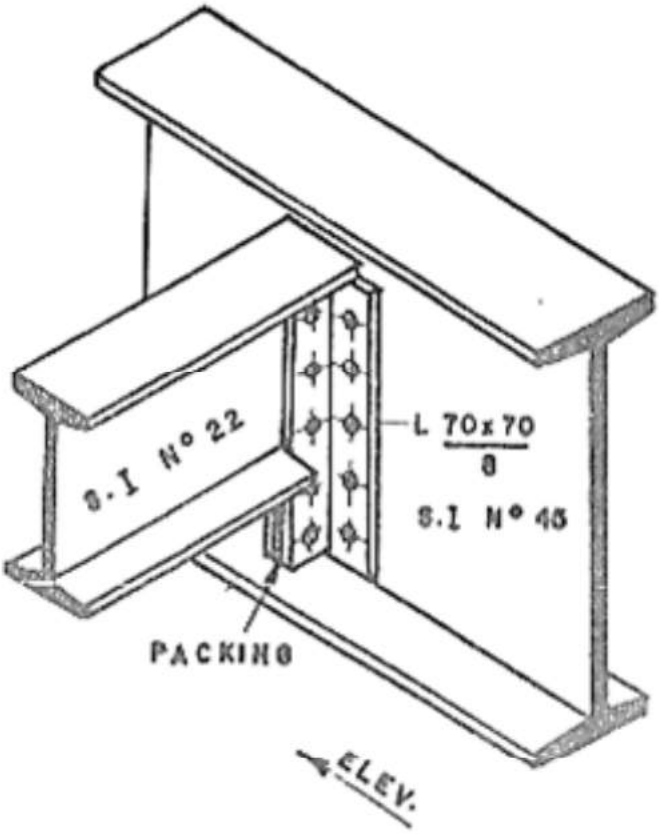


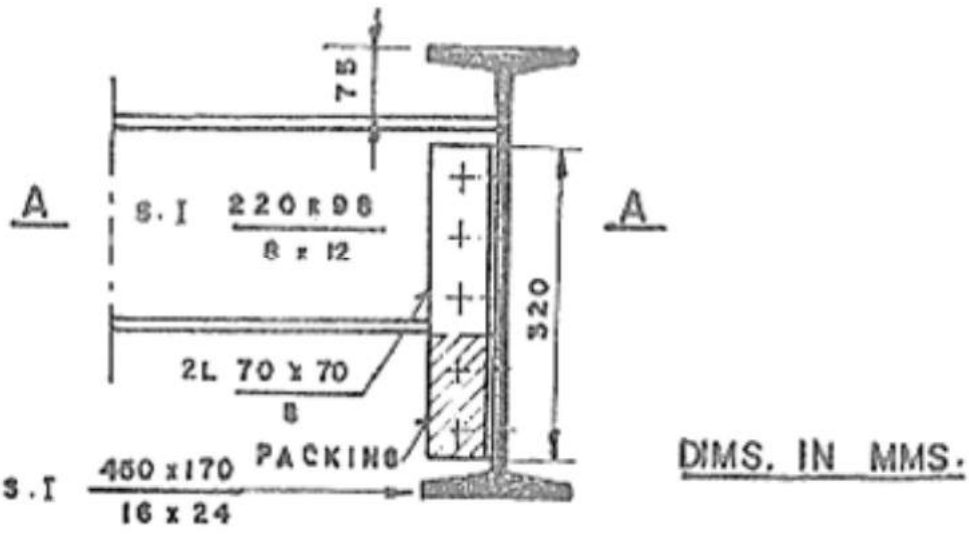
8.3. GIVEN THE FRONT ELEVATION VIEW. IT IS REQUIRED TO DRAW IN A SCALE OF 1:5 THE FOLLOWING VIEWS:

A) ELEVATION

B) PLAN IN SECTIONAL VIEW A-A

C) SIDE VIEW





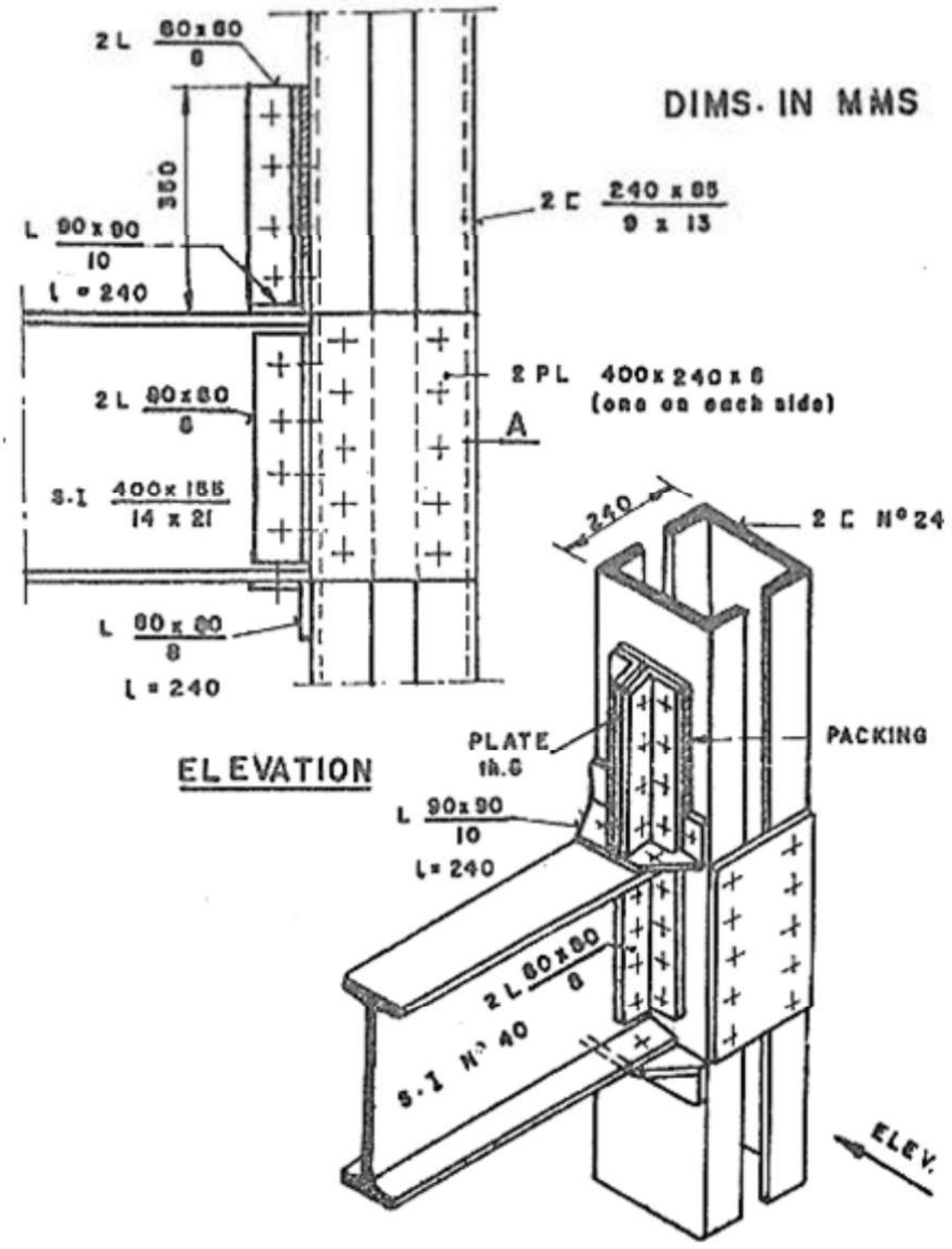
ELEVATION

8.4. GIVEN THE ISOMETRIC AND THE FRONT ELEVATION VIEWS. IT IS REQUIRED TO DRAW IN A SCALE OF 1:5 THE FOLLOWING VIEWS:

A) ELEVATION

B) PLAN IN SECTIONAL VIEW A-A

C) SIDE VIEW

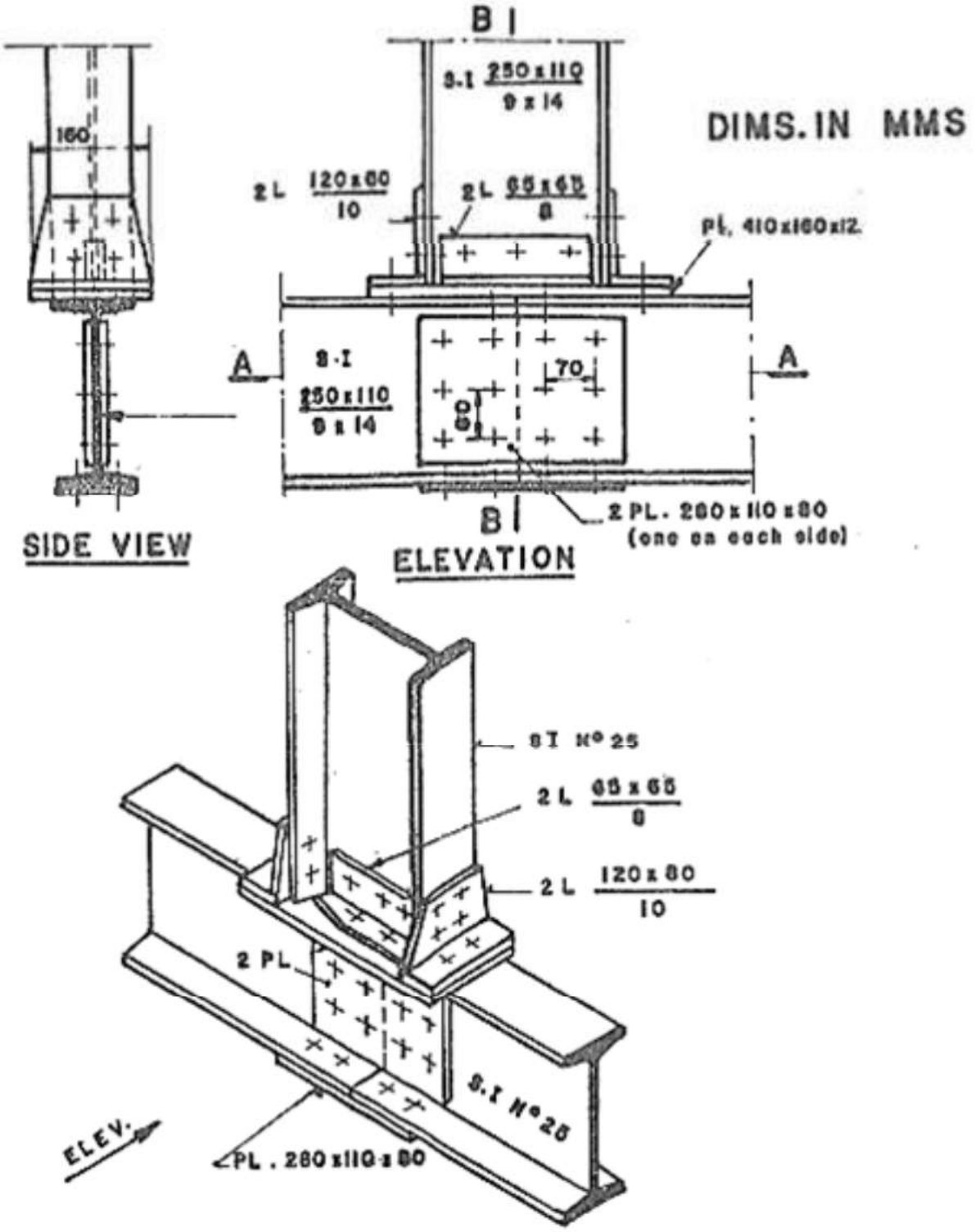


8.5. GIVEN THE ISOMETRIC VIEW. IT IS REQUIRED TO DRAW IN A SCALE OF 1:5 THE FOLLOWING VIEWS:

A) ELEVATION

B) PLAN IN SECTIONAL VIEW A-A

C) SIDE VIEW

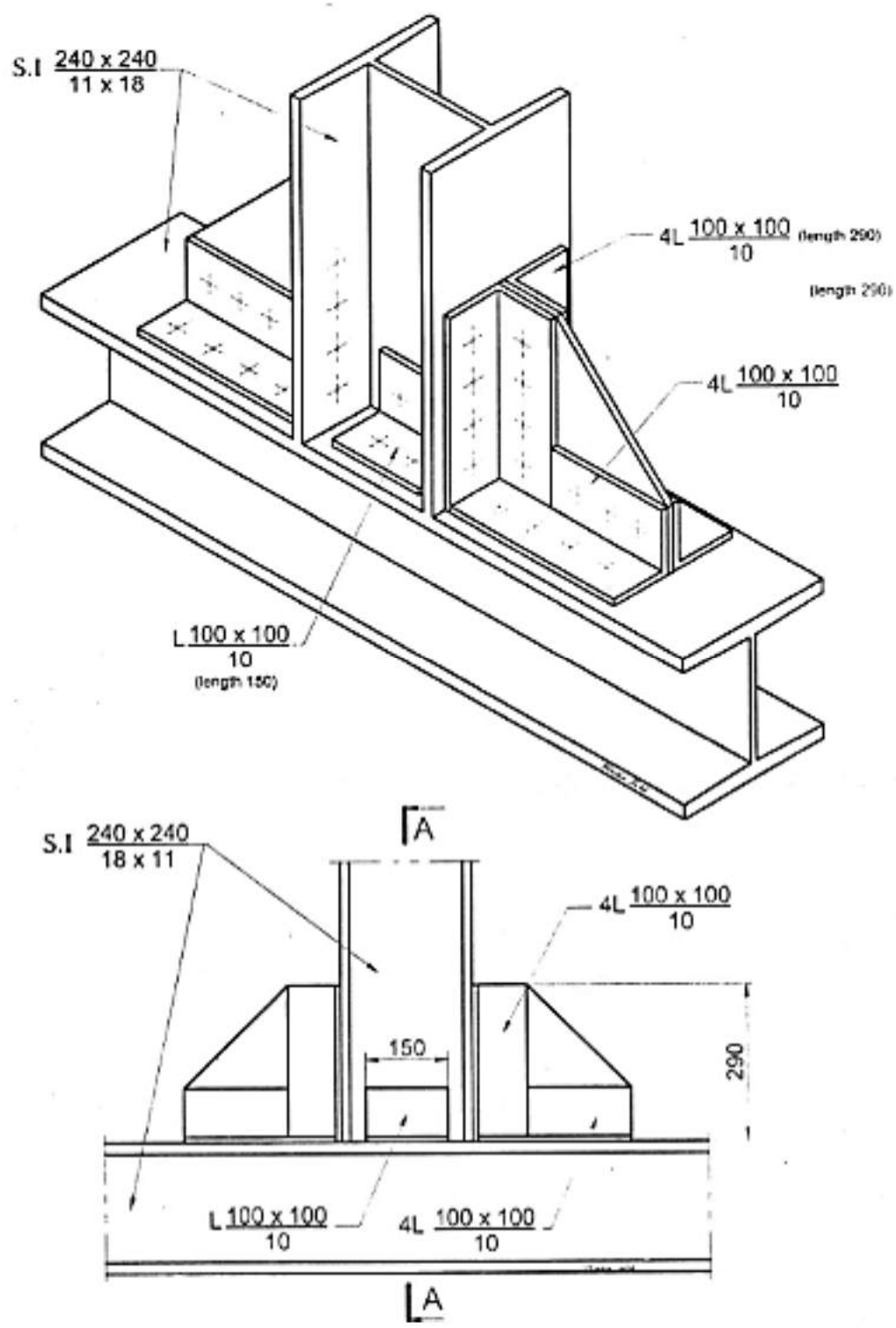


8.6. GIVEN THE ISOMETRIC AND THE FRONT ELEVATION VIEWS. IT IS REQUIRED TO DRAW IN A SCALE OF 1:5 THE FOLLOWING VIEWS:

A) ELEVATION

B) PLAN

C) RIGHT SIDE VIEW IN SECTIONAL VIEW A-A

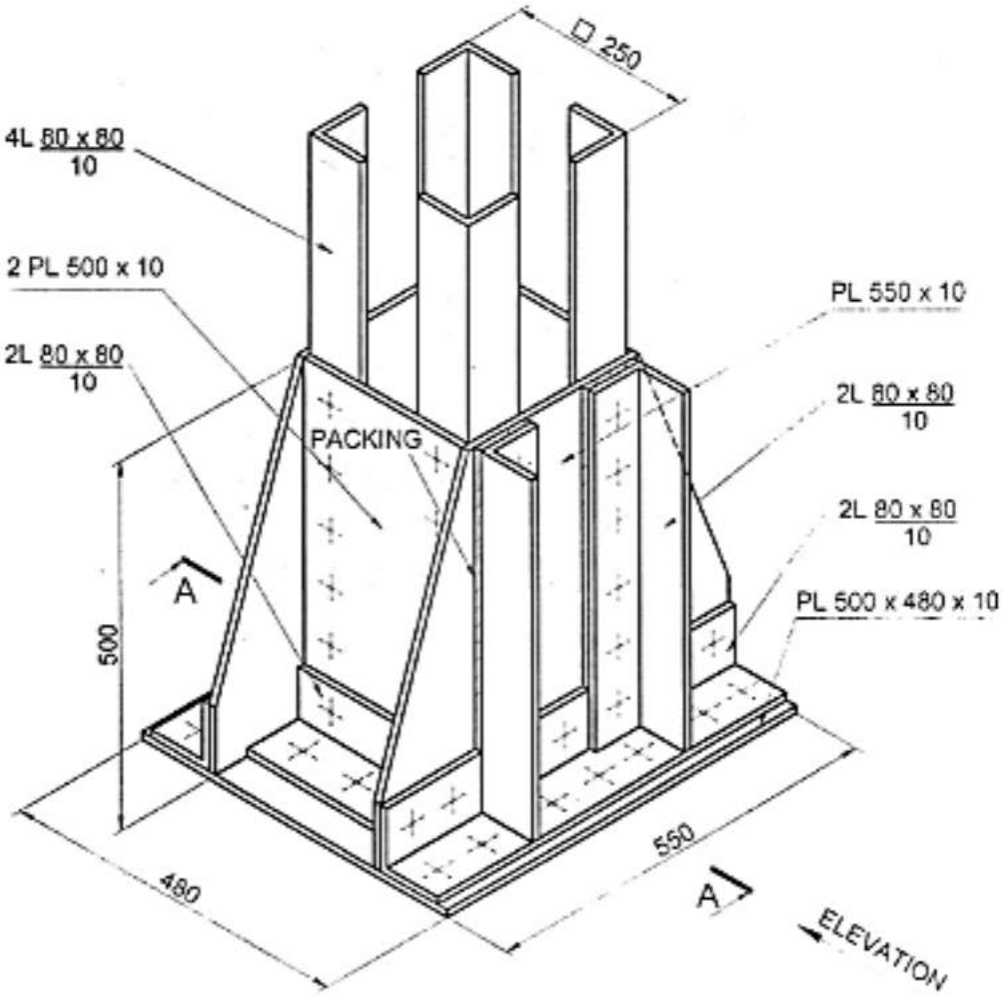


8.7. GIVEN THE ISOMETRIC VIEW. IT IS REQUIRED TO DRAW IN A SCALE OF 1:5 THE FOLLOWING VIEWS:

A) ELEVATION

B) PLAN

C) LEFT SIDE VIEW IN SECTIONAL VIEW A-A



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