ENGINEERING DRAWING

Time allowed : 3 hours ***Maximum Marks : 70***

Note :

(i) Attempt ***all*** *the questions.*

(ii) Use both sides of the drawing sheet, if necessary.

(iii) All dimensions are in millimeters.

(iv) Missing and mismatching dimensions, if any, may be suitably assumed.

(v) Follow the SP : 46-1988 codes

(with First Angle method of projection).

(vi) In no view of questions 1 and in no sectioned view of question 3, are hidden edges / lines required.

QUESTION PAPER CODE 68/1

1. (a) Construct an isometric scale, 90 mm long. 4

(b) Construct the isometric projection, to isometric scale, of a pentagonal pyramid (base edge = 40 mm and height = 90 mm), keeping it in the inverted position. The axis is perpendicular to H.P. One of its base edges is parallel to V.P. and away from that. Draw the axis and indicate the direction of viewing. Give all dimensions. 8

(c) A cone (diameter = 40 mm and height = 60 mm) is placed, centrally, with its base on the hexagonal face of a hexagonal prism (base edge = 40 mm and height = 25 mm). The common axis is perpendicular to H.P. The base of the prism is on H.P., and one of the base edges is perpendicular to V.P.

Draw the isometric projection of the solids, placed together, to isometric scale. Draw the common axis and indicate the direction of viewing. Give all dimensions. 13

2. (a) Draw to scale 1 : 1, the standard profile of a metric thread (internal), taking enlarged pitch = 40 mm. Give standard dimensions. 9

OR

Draw to scale 1 : 1, the. front view and top view of a Tee bolt of size M 20. Keep the axis vertical. Give standard dimensions.

(b) Sketch freehand the front view and top view of a grub screw of size M 25. Keep the axis vertical. Give standard dimensions. 6

OR

Sketch freehand the front view and the top view of a pan head rivet, shank diameter = 20 mm. Keep the axis vertical. Give standard dimensions.

3. Fig. 1 shows the details of a Plummer block. Assemble the parts correctly and draw, to scale 1 : 1, the front view, right half in section. 24

Print title and scale used.

Give 8 important dimensions. 6

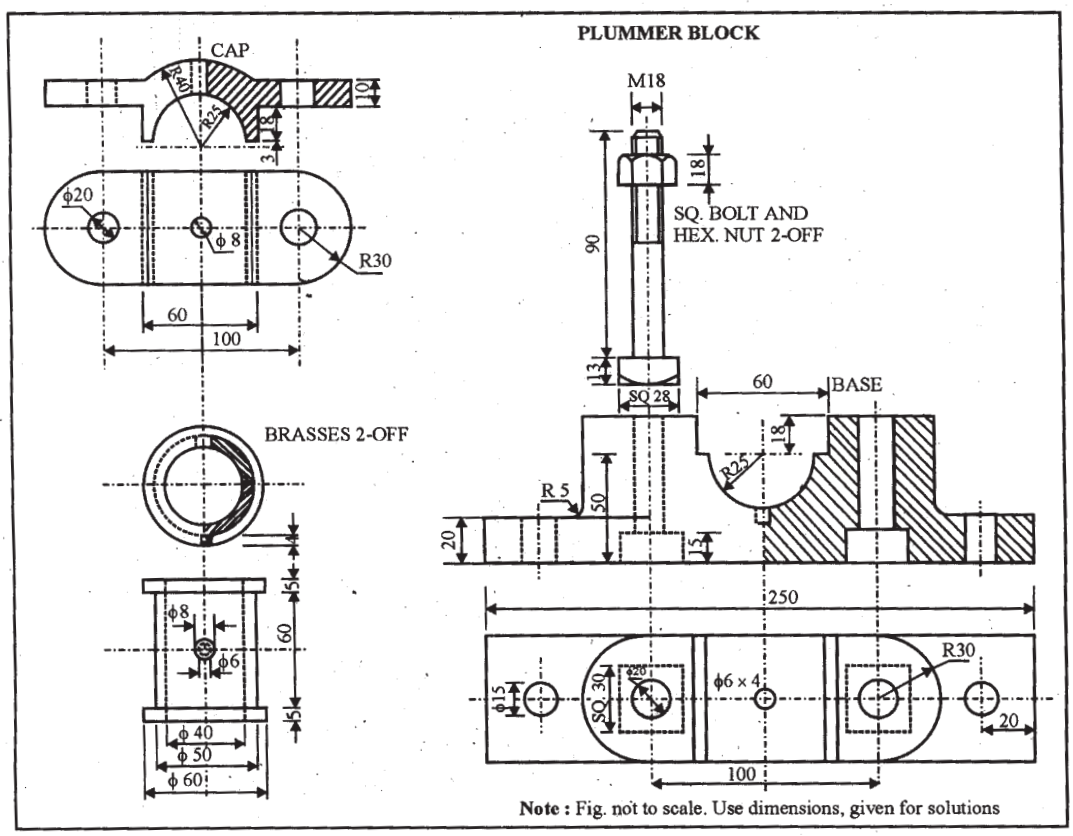


Figure 1

Fig. 2 shows, partly, the assembly of a flanged pipe joint. Disassemble the parts and then draw the following views, to scale 1 : 1. Keep the same position of the parts with respect to H.P. and V.P. :

(a) Front view of the flange A, showing the top half in section and side view, as seen from the left. 16

(b) Front view of any hexagonal nut and the side view, as seen from the right. Print titles of both and scale used. 8

Draw the projection symbol. Give 8 important dimensions. 6

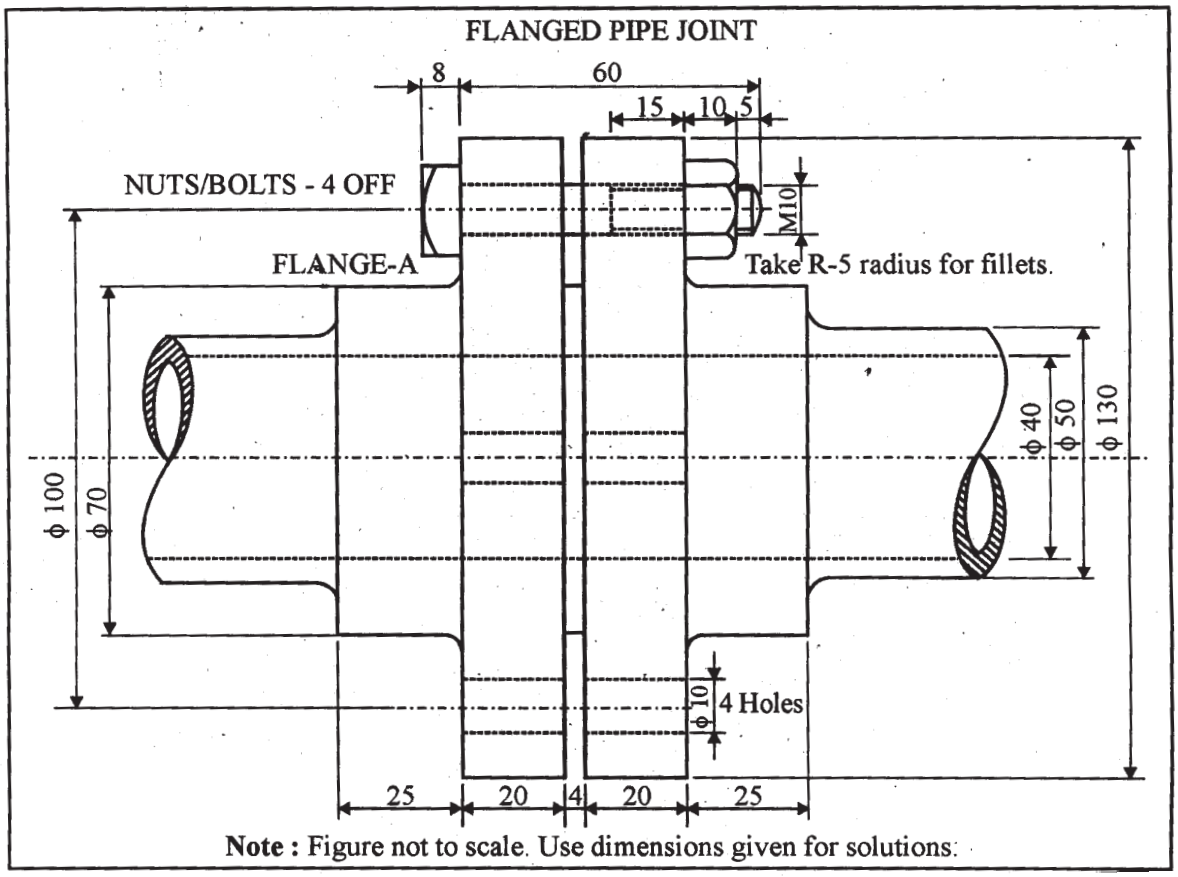


Figure - 2

QUESTION PAPER CODE 68

1. (a) Construct an isometric scale 80 mm long. 4

(b) Construct the isometric projection, to isometric scale, of a hexagonal pyramid (base edge = 30 mm and height = 80 mm) keeping it in the inverted position. The axis is perpendicular to H.P. One base edge is perpendicular to V.P.

Draw the axis and indicate the direction of viewing. Give all dimensions. 7

(c) A cylinder (diameter = 50 mm and height = 70 mm) is placed, centrally, with its circular end on the pentagonal face of a pentagonal prism (base edge = 40 mm and height = 30 mm). The common axis is perpendicular to H.P. The base of the prism is on H.P. and one of its base edges is parallel to V.P. and away from it.

Draw the isometric projection of the solids, placed together, to isometric scale. Draw the common axis and indicate the direction of viewing. Give all dimensions. 14

2. (a) Draw to scale 1:1 the standard profile of a B.S.W. thread, taking enlarged pitch = 50 mm. Give all standard dimensions. 9

OR

Draw the full sectional front view and top view of a single riveted lap joint. Take plate thickness = 9 mm. Give all standard dimensions. Use scale 1 : 1.

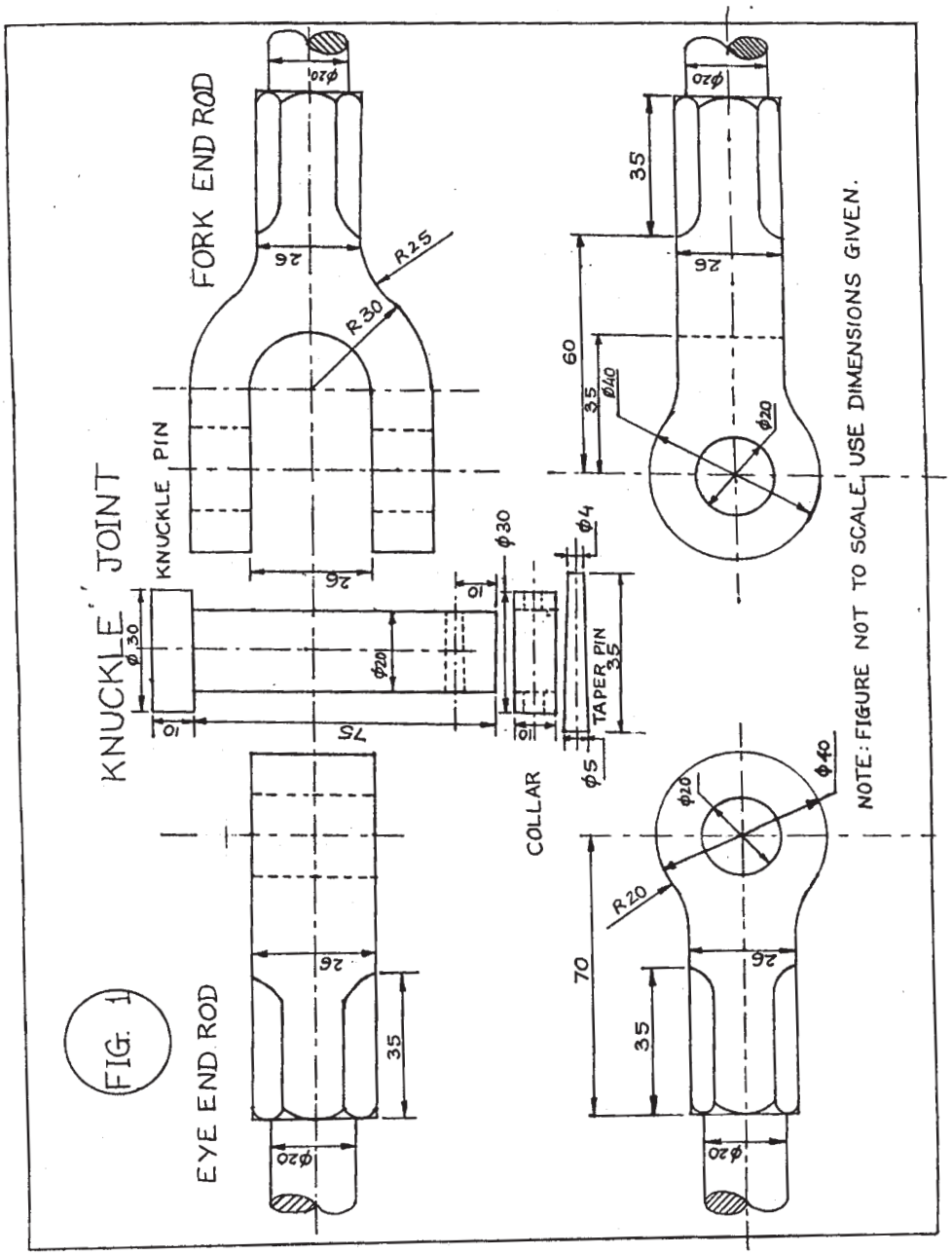
(b) Sketch free-hand the front view and top view of a 90° flat counter sunk head screw of size M 20, keeping the axis vertical. Give all standard dimensions. 6

OR

Sketch free-hand the front view, top view and side view of a Woodruff key for a shaft of 60 mm diameter. Give all standard dimensions.

3. Figure 1, shows the details of a knuckle joint. Assemble the parts correctly and then draw, to scale 1 : 1, the front view, lower half in section. 24

Print title and scale used. Give 8 important dimensions. 6



OR

Figure 2, shows the assembly of an open bearing. Disassemble the base and the bush and draw the following views to scale 1 : 1. Keep the same positions of the base and the bush with respect to H.P. and V.P.

(a) Front view of the base, showing right half in section, and its top View. 16

(b) Front view of the bush and full sectional side view, as seen from the left side. 8

Print titles of both and scale used. Draw the projection symbol. Give 8 important dimensions. 6

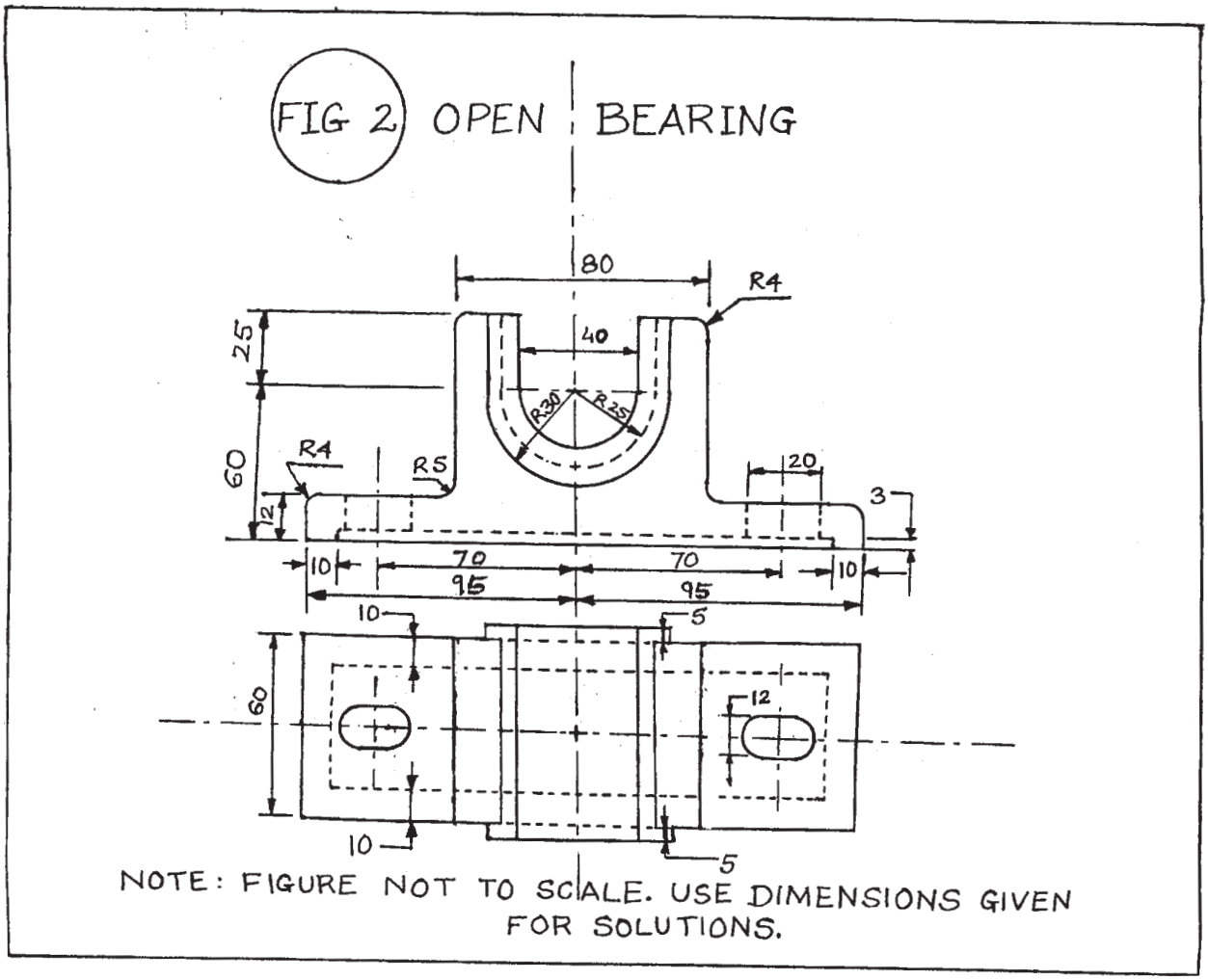


FIG 2 OPEN BEARING
80
R4
40
25
R30
R25
60
R4
R5
20
3
12
10
70
70
10
95
95
10
5
60
12
10
5
NOTE: FIGURE NOT TO SCALE. USE DIMENSIONS GIVEN FOR SOLUTIONS.

Marking Scheme — Engineering Drawing

Notes:

(i) Marks are to be awarded in proportion to the work done.

(ii) Mistakes in dimensioning up to ± 1.0 mm may be ignored.

(iii) In dimensioning, arrow–heads of various types, as per SP46-1988, are usable. However, where space is too small for an arrowhead, oblique stroke or a dot may be employed.

(iv) In no view of questions '1' and in no sectioned view of question 3, are hidden edges/lines required.

(v) Other standard methods of drawing/proportions for features like nuts, heads of bolts, screws etc., employed by examinees, may also be accepted.

All Questions are to be answered correctly and accurately.

QUESTION PAPER CODE 68/1

EXPECTED ANSWERS/VALUE POINTS

Q.1 ISOMETRIC SCALE **(4)**

(a) (i) Marking of divisions of 10 mm, 1 mm on true scale and marking angles of 30° & 45°. 1

(ii) Projections from scale 1:1 to get points on Isometric scale. ½

(iii) Construction of Isometric scale with main divisions of 10 mm each. 1

(iv) Division of the first part into 10 sub-divisions. 1

(v) Printing "Scale 1:1" and 'Isometric Scale' ½

(b) ISOMETRIC PROJECTION OF AN INVERTED PENTAGONAL PYRAMID **(8)**

(i) Helping view (with isometric scale or scale 1:1) of pentagon with a side, parallel to V.P. and away from it. 1

(ii) Drawing isometric pentagon on top. 3

(iii) Drawing slant edges. 1½

(iv) Marking the axis 1

(v) Two dimensions, including that of axis through in-centers 1

(vi) Direction of viewing ½

Note: For incorrect position of the pyramid, like using the 40mm sides of the pentagon for the base, 1 ½ marks should be deducted. If axis is drawn perpendicular to V.P. instead of drawing perpendicular to H.P., as asked, 1½ marks should be deducted. Also, in the helping view, if a side of pentagon is not taken parallel to V.P. and away from it, 1 mark (½ + ½) should be deducted.

(c) CONE PLACED, CENTRALLY, ON A HEXAGONAL PRISM. (13)

(A) HEXAGONAL PRISM (7)

(i) Helping view of hexagon with a side perpendicular to V.P. 1

(ii) Drawing isometric hexagons 3

(iii) Drawing face edges, parallel to vertical axis/V.P. 2

(iv) Dimensioning the edge of the base and axis, i.e. height of prism. 1

(B) CONE AND DIRECTION OF VIEWING (6)

(i) Drawing elliptical curve for base 2½

(ii) Drawing tangents to curves, i.e. generators 1

(iii) Indicating the common axis of two solids 1

(iv) Dimensioning of diameter and axis 1

(v) Direction of viewing ½

Note: For incorrectly placed solids, etc., proportionate deductions, as proposed in Q.1 (b) may be used.

Q.2 (a) METRIC SCREW THREAD PROFILE (INTERNAL) (9)

(i) Distance, equal to pitch, marked correctly and angles of 60°, drawn correctly 2

(ii) Flat edges and curves for threads (minimum 2), drawn correctly 2½

(iii) Side edges (flanks), drawn correctly 1½

(iv) Dimensioning 2

(v) Neatness and line work 1

OR

TEE BOLT **(9)**

FRONT VIEW

(i) Threaded and unthreaded portions of cylindrical shank, square neck and center line. 2½

(ii) Head of bolt 1½

TOP VIEW

(i) Circles of diameter 'd' and 0.85 d (thin and broken) 1

(ii) Square neck and rest of the portion 1½

Details:

(i) Dimensioning 1½

(ii) Neatness and line work 1

Note: 3 marks may be deducted, in all, if sketched freehand, instead of drawing to scale 1:1.

Q.2 (b) FOLLOWING COMPONENTS ARE TO BE SKETCHED FREEHAND PROPORTIONATELY:

GRUB SCREW (SIZE M25) **(6)**

(i) Front view with its axis, perpendicular to H.P. 3

(ii) Top view 2

(iii) Dimensions 1

OR

PAN HEAD RIVET (for a diameter of rivet of 25 mm) **(6)**

FRONT VIEW

(i) Sketching the head with correct proportions. 2½

(ii) Sketching cylindrical portion, broken end and hatching 1½

TOP VIEW

(i) Two circles 1

(ii) Dimensioning 1

Note: 2 marks may be deducted, if these components are drawn with instruments, instead of being sketched freehand.

Q.3 PLUMMER BLOCK (Assembly) (30)

(A) FRONT VIEW, RIGHT HALF IN SECTION (15)

(i) Base:

(a) Right half in section with two holes with their axes. 4½

(b) Left half, without section, with properly located axes for holes. 2½

(ii) Brasses (Upper & lower):

(a) Drawn in correct position with right half in section alongwith oil hole and snug. 3

(b) Left half without section 2

(iii) Cap:

(a) Right half in section with holes for bolt and oil. 3

(b) Left half without section. 1½

(iv) Square headed bolts:

(a) Full bolt on the right. 3

(b) End of bolt, coming out of nut, on the left, alongwith shank between the base and the cap. 1½

(v) Hexagonal nuts: One nut, placed properly, on each side 3

(B) DETAILS:- (6)

(i) Neatness and line work. **2**

(ii) Printing title and scale used **2**

(iii) Showing 8 dimensions **2**

OR

FLANGED PIPE JOINT (Dis-assembly) **(30)**

(A) FLANGE A **(16)**

FRONT VIEW, TOP HALF IN SECTION

(i)	Boundary with conventional representation of end of pipe	3½
(ii)	Properly located axes of pipe and two holes for bolts	1½
(iii)	Line indicating inner radius of pipe, hatching lines and holes	3
(iv)	Remaining two vertical lines in lower half	1

SIDE VIEW, AS SEEN FROM THE LEFT

(i)	Four circles, axes and the hatching lines	3
(ii)	Drawing four holes for bolts and the pitch circle	2½
(iii)	Drawing cutting plane XX' for the front view	½
(iv)	Neatness and line work	1

(B) HEXAGONAL NUT

FRONT VIEW **(8)**

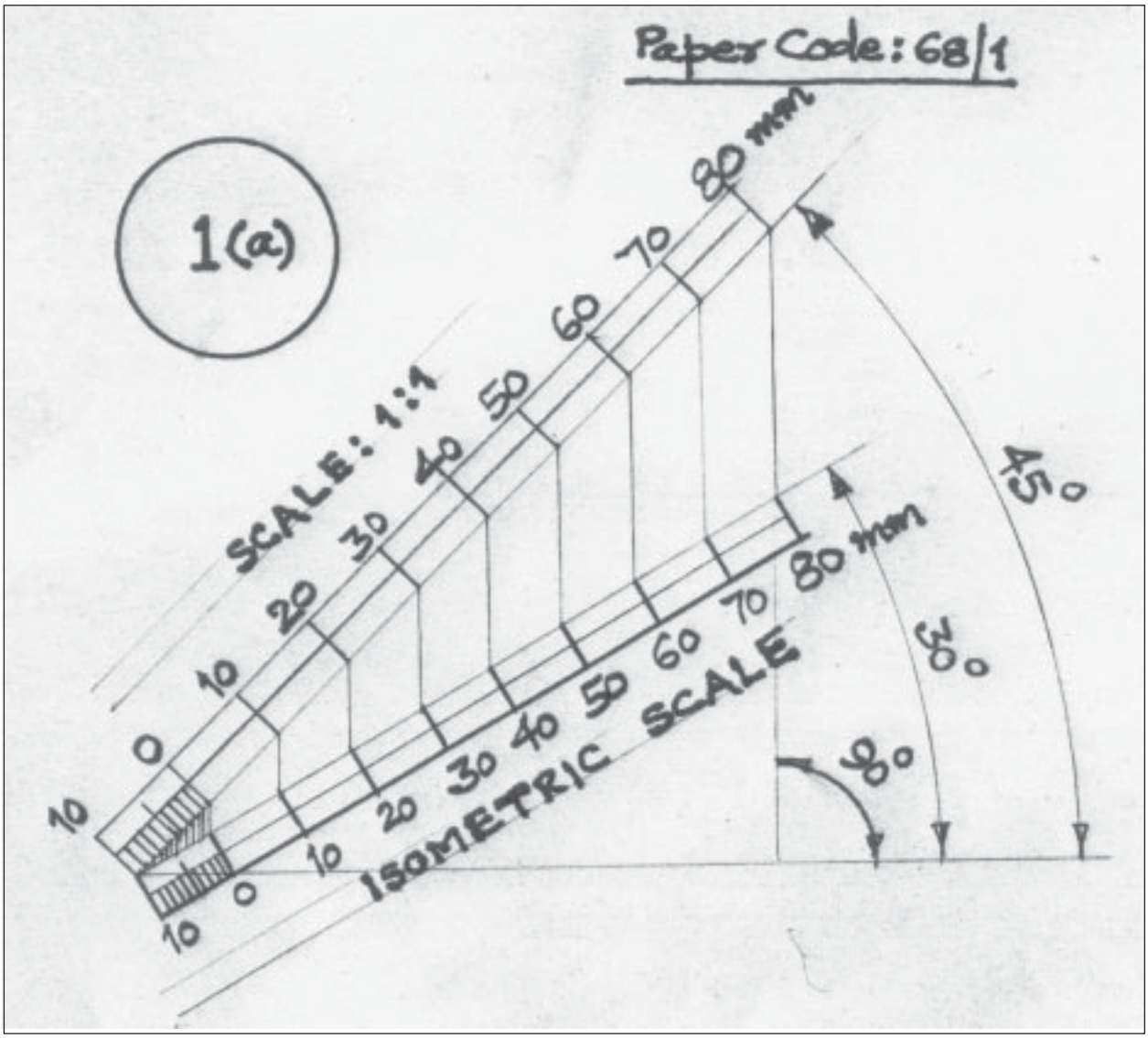
(i)	Drawing horizontal axis, one vertical line for base of nut and four horizontal lines	1½
(ii)	Drawing curves for chamfer of nut, the associated vertical line and chamfer lines	2

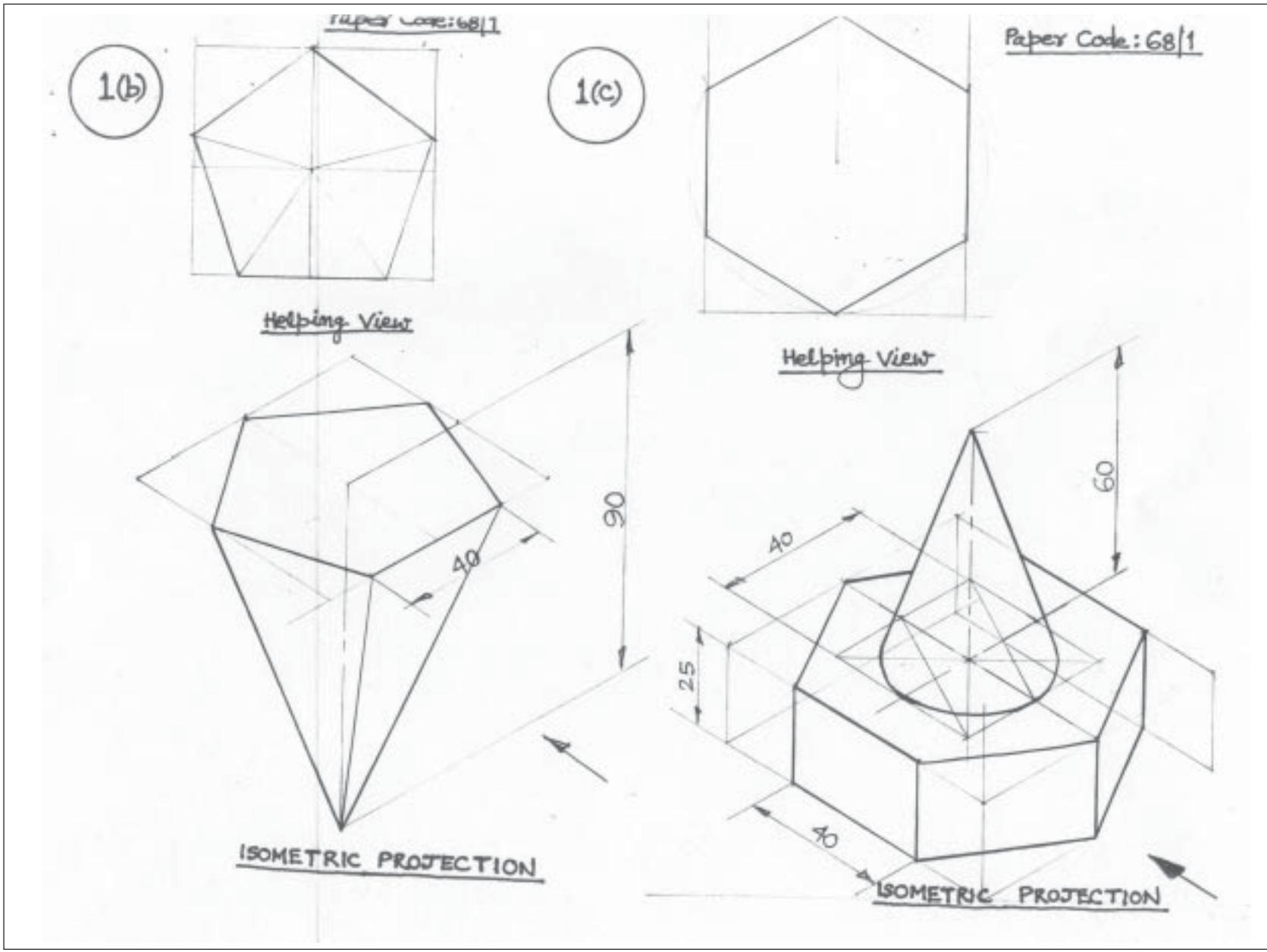
SIDE VIEW, AS SEEN FROM THE RIGHT

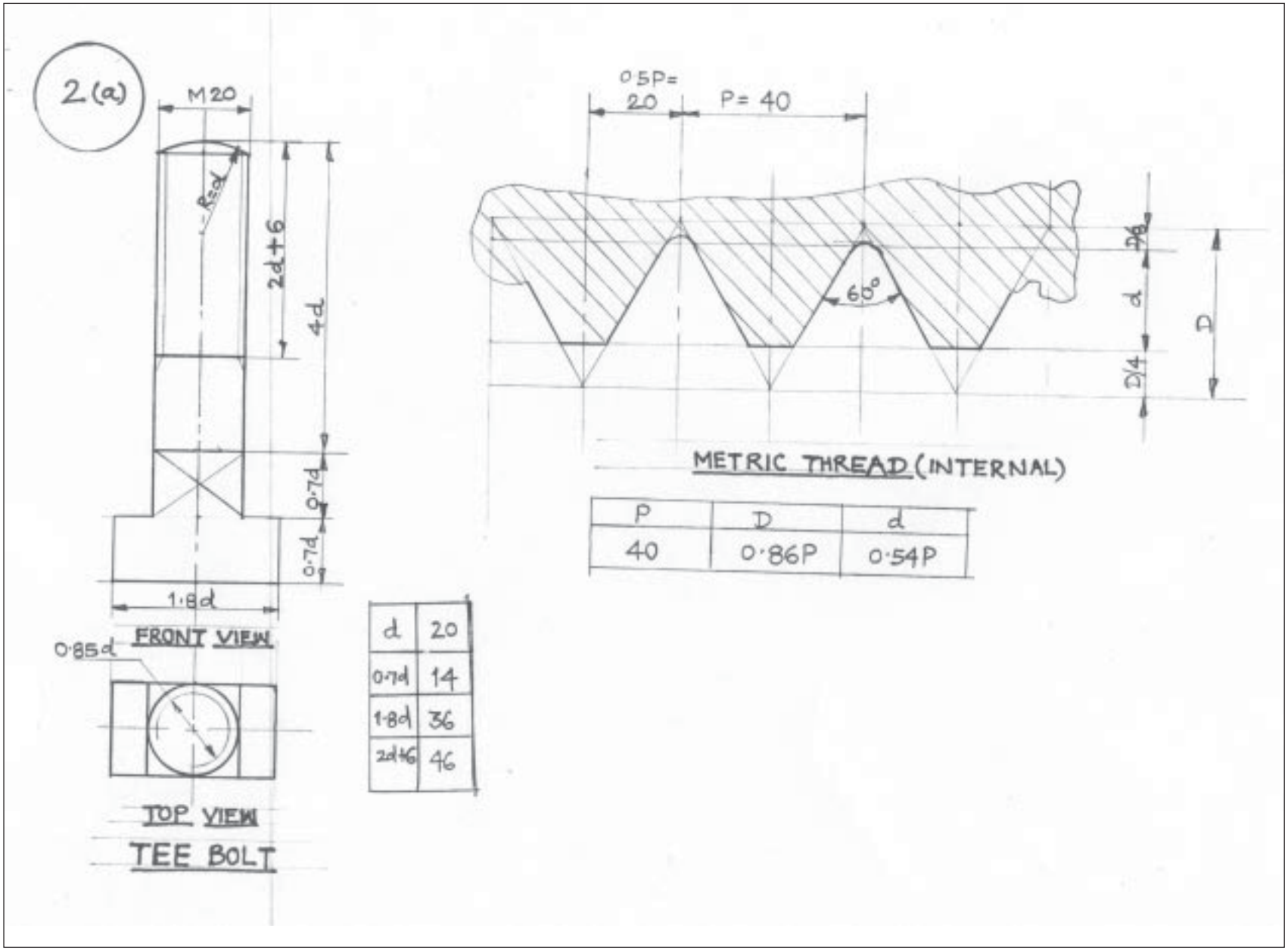
(i)	Drawing the chamfer circle, two circles – one broken and other full and the circumscribing hexagon.	3
(ii)	Drawing the horizontal and the vertical axis.	½
(iii)	Neatness and line work	1

DETAILS **(6)**

(i)	Printing titles	2
(ii)	Projection symbol	1
(iii)	Scale used	1
(iv)	Dimensioning	2

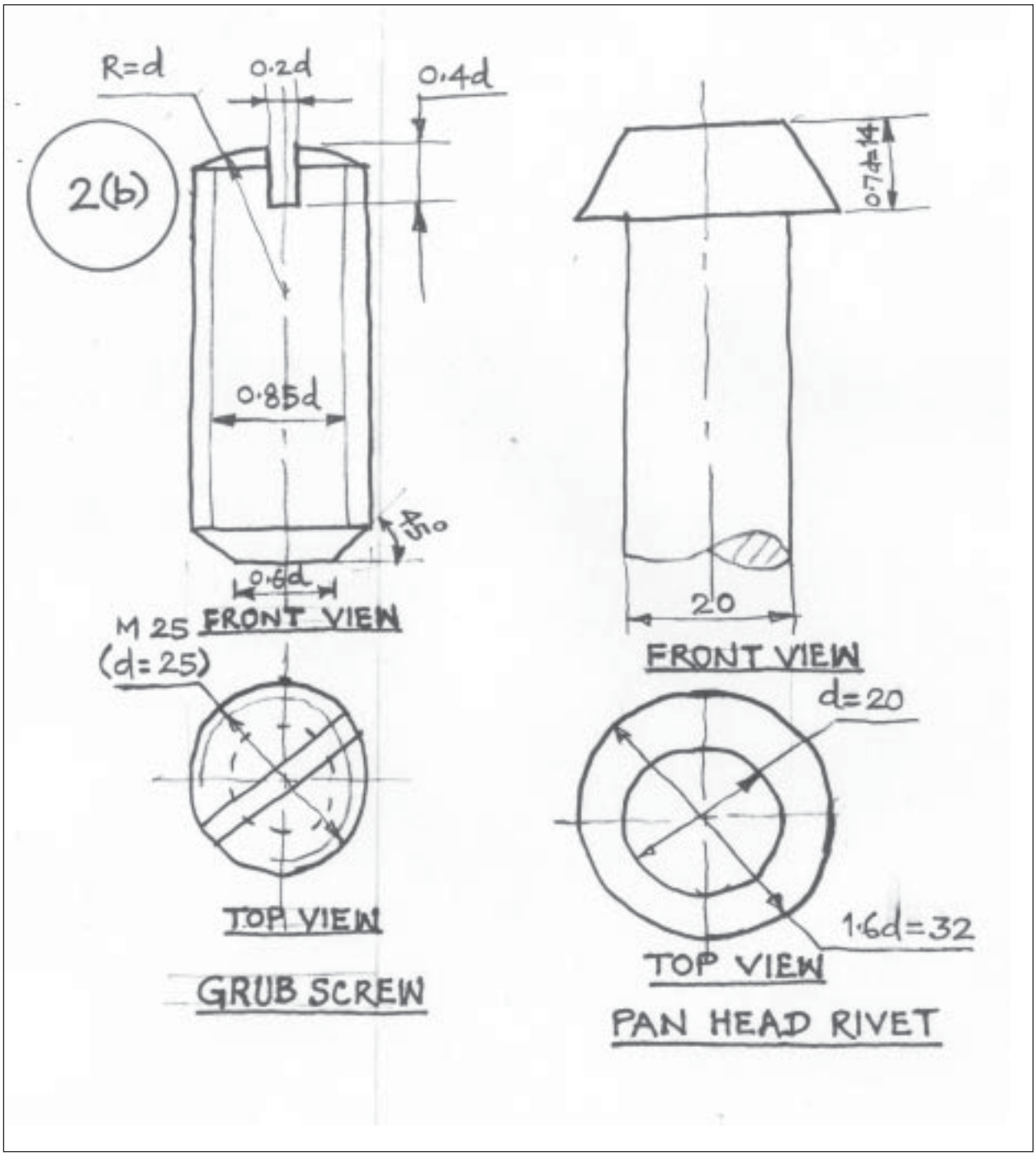

Paper Code: 68/1
1(a)
SCALE: 1:1
ISOMETRIC SCALE
80 mm
80 mm
45°
30°
90°

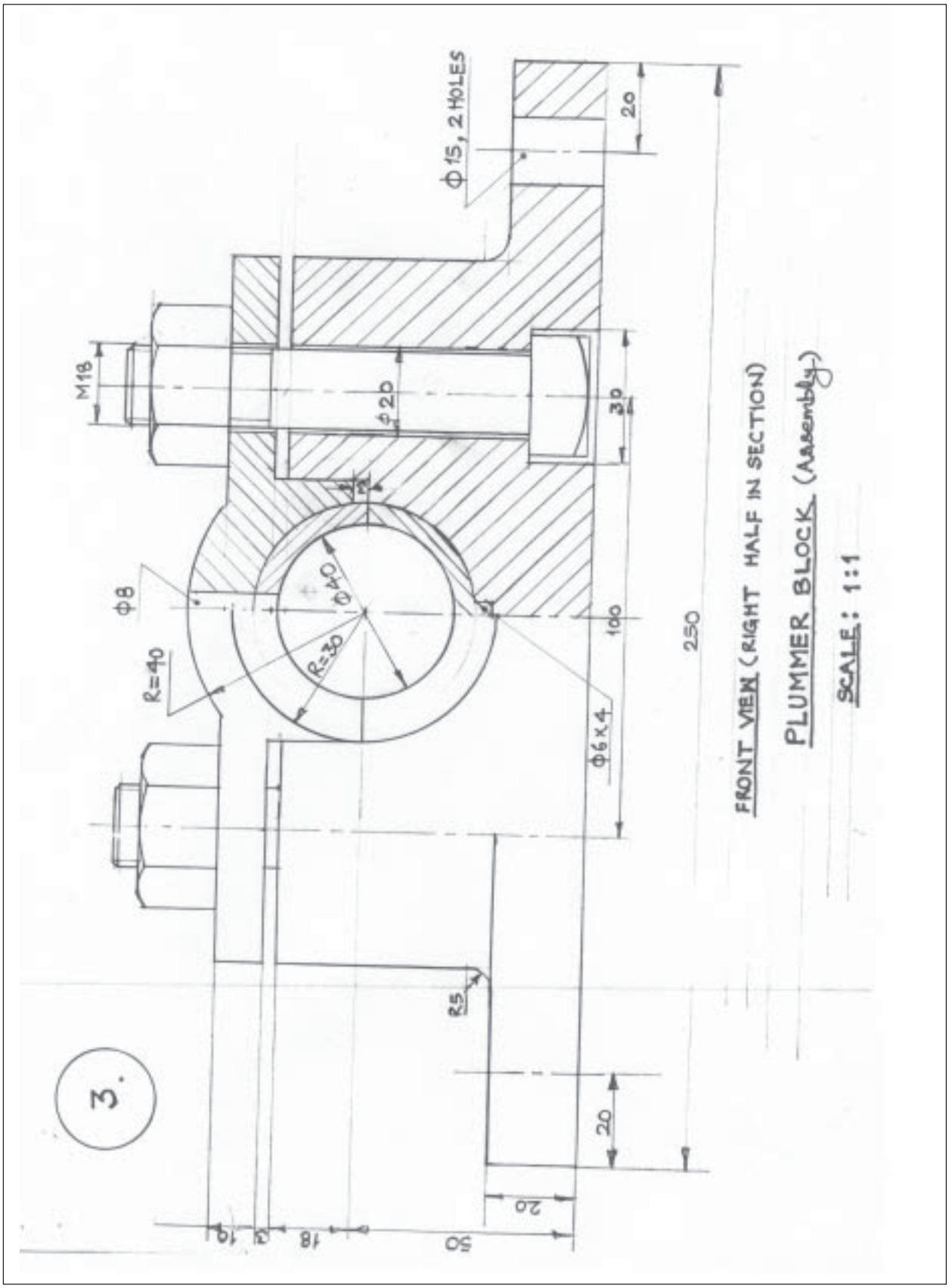

Paper Code: 68/1
1(b)
Helping View
90
40
ISOMETRIC PROJECTION
1(c)
Paper Code: 68/1
Helping View
60
40
25
40
ISOMETRIC PROJECTION

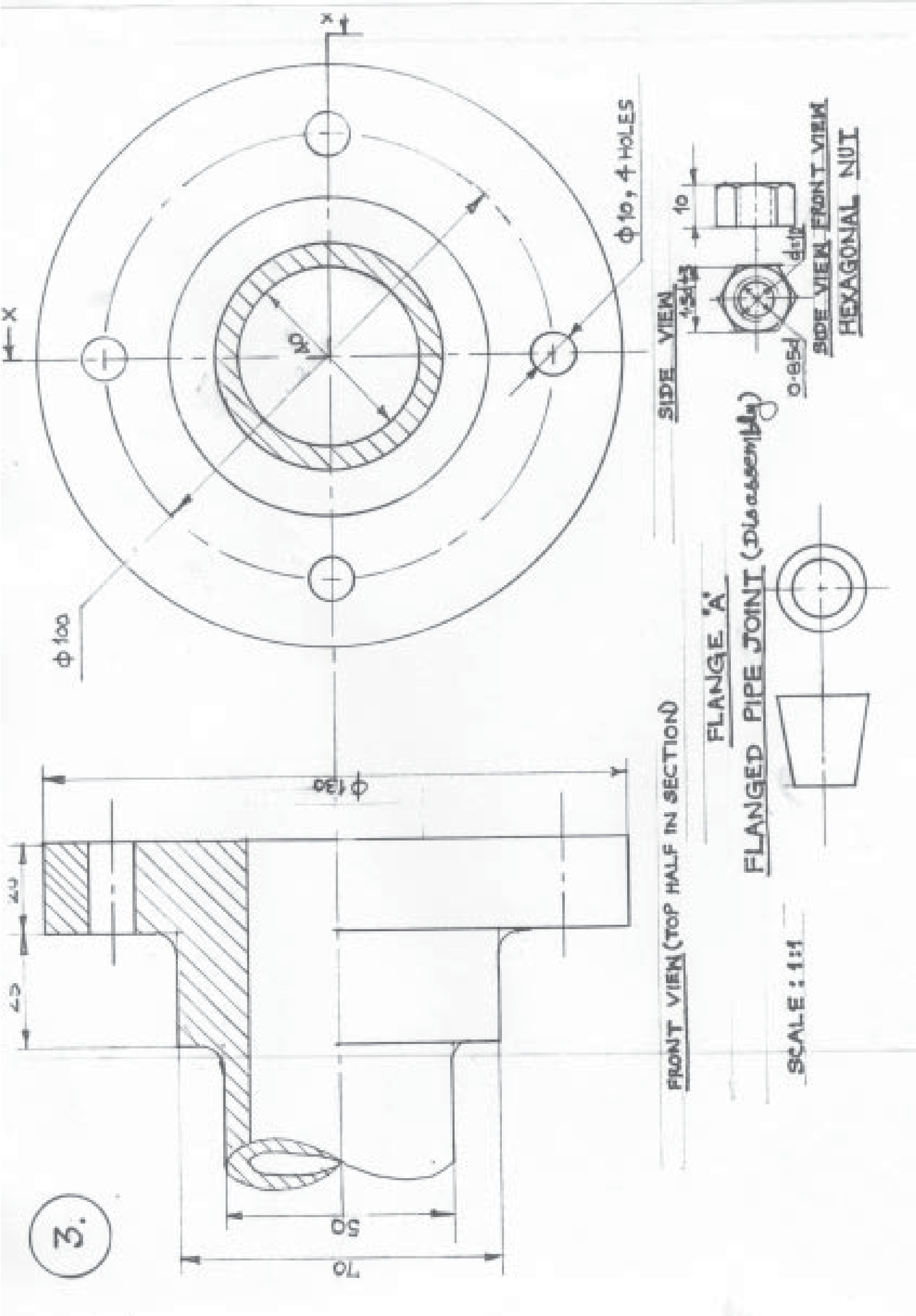


d	20
0·7d	14
1·8d	36
2d+6	46

P	D	d
40	0·86P	0·54P


2(b)
R=d
0.2d
0.4d
0.85d
0.6d
M 25
(d=25)
FRONT VIEW
TOP VIEW
GRUB SCREW
0.7d=14
20
FRONT VIEW
d=20
1.6d=32
TOP VIEW
PAN HEAD RIVET


3.
Φ15, 2 HOLES
20
M18
Φ26
30
Φ8
Φ40
R=30
R=40
100
250
Φ6 x 4
R5
20
20
18
10
50
FRONT VIEW (RIGHT HALF IN SECTION)
PLUMMER BLOCK (Assembly)
SCALE: 1:1


3.
FRONT VIEW (TOP HALF IN SECTION)
SIDE VIEW
FLANGE "A"
FLANGED PIPE JOINT (Disassembly)
SCALE : 1:1
Φ10, 4 HOLES
Φ100
Φ130
50
70
20
10
0.85d
SIDE VIEW FRONT VIEW
HEXAGONAL NUT

QUESTION PAPER CODE 68

EXPECTED ANSWERS/VALUE POINTS

Q.1 (a) <u>ISOMETRIC SCALE</u> (4)

(i) Marking of divisions of 10 mm, 1 mm on true scale and marking angles of 30° & 45°. 1

(ii) Projections from scale 1:1 to get points on Isometric scale. ½

(iii) Construction of Isometric scale with main divisions of 10 mm each. 1

(iv) Division of the first part into 10 sub-divisions. 1

(v) Printing "Scale 1:1" and 'Isometric Scale' ½

(b) ISOMETRIC PROJECTION OF AN INVERTED <u>HEXAGONAL PYRAMID</u> (7)

(i) Helping view(with isometric scale or scale 1:1) of hexagon with a side, perpendicular to V.P. 1

(ii) Drawing isometric hexagon on top 2 ½

(iii) Drawing slant edges 1 ½

(iv) Marking the axis and direction of viewing 1

(v) Two dimensions, including that axis through in-centres 1

<u>Note</u>:- For incorrect position of the pyramid, like using the 30mm sides of the hexagon for the base , 1½ marks should be deducted if axis is drawn perpendicular to V.P., instead of drawing perpendicular to H.P., as asked , 1½ should be deducted, Also, in the helping view, if a side of hexagon is not taken perpendicular to V.P., as asked, 1mark should be deducted.

(c) CYLINDER, PLACED, CENTRALLY, ON PENTAGONAL PRISM: (14)

<u>PENTAGONAL PRISM:</u>

(i) Helping view (with isometric scale or scale 1:1) of pentagon with a side, parallel to V.P. and away from it. 1

(ii) Drawing isometric pentagons at the top and bottom 3

(iii) Drawing face edges parallel to axis. 1½

(iv) Dimensioning (base side and height) 1

CYLINDER:-

(i) Correct central placement and drawing common vertical axis. 1½

(ii) Drawing ellipses for top and base. 3

(iii) Drawing to tangents to ellipses 1

(iv) Dimensioning diameter and axis through in —centres 1

(v) Neatness and line work 1

Note: For incorrectly placed solids etc. proportionate deductions, as proposed in Q.1 (b) may be used.

Q.2 (a) B.S.W . THREAD PROFILE (9)

(i) Distances, equal to pitch, marked correctly and angles 55° drawn correctly. 2

(ii) Curves for threads (minimum 2 curves at the top and bottom) 2

(iii) Side edges (flanks) , tangential to the curves 2

(iv) Dimensioning 2

(v) Neatness and line work 1

OR

SINGLE RIVETED LAP JOINT (9)

SECTIONAL FRONT VIEW

(i) Plates with hatching line 2

(ii) Rivet with both head 2

TOP VIEW

(i) Two plates correctly positioned. 1

(ii) Rivet heads (minimum 2) with correct pitch length and their axes along with Cutting plane line 2

(iii) Dimensioning, neatness and line work. 2

Note: 3 marks may be deducted, in all, if sketched freehand, Instead of drawings to scale 1:1

Q.2 (b) 90° FLAT COUNTER SUNK HEAD SCREEN **(6)**

(i) Sketching front view with its axis, perpendicular to HP 3

(ii) Sketching top view. 2

(iii) Dimensioning 1

OR

WOOD RUFF KEY

(i) In front view, keeping horizontal edge at 0.25 t below the centre 1

(ii) Drawing the horizontal edge and curve with a radius of R = 2t 2

(iii) Drawing side view 1

(iv) Drawing top view 1

(v) Dimensioning 1

Note: 2 marks may be deducted if these components are drawn with instruments, instead of being sketched free hand.

Q.3 KNUCKLE JOINT (Assembly): **(30)**

FRONT VIEW, LOWER HALF IN SECTION: (24)

(i) Fork (complete), with lower half in section. 9

(ii) Single eye end (complete), with lower half in section, positioned correctly 5

(iii) Knuckle pin (fitted) and positioned correctly. 3

(iv) Collar, positioned correctly, with hatching lines. 2

(v) Taper pin, positioned correctly. 3

(vi) Neatness and line work. 2

Printing title (1), scale used (1) and eight dimensions (4) **(6)**

(OR)

OPEN BEARING (Disassembly) **(30)**

(A) BASE: (16)

FRONT VIEW, RIGHT HALF IN SECTION

(i) Full boundary of base along with properly located axes (four in all) and all the fillets and rounds. 6

(ii) For right half – sectioned portion of the base, hatching lines, hole and base – recess 3

TOP VIEW

(i) Complete boundary with four vertical lines and dotted rectangle (indicating recess) 3½

(ii) Two bolt holes and cutting plane lines 2½

(iii) Neatness and line work. 1

BUSH **(8)**

FRONT VIEW

(i) Six vertical lines 1½

(ii) Three semi circles and cutting plane line 2

SIDE VIEW (FULL IN SECTION)

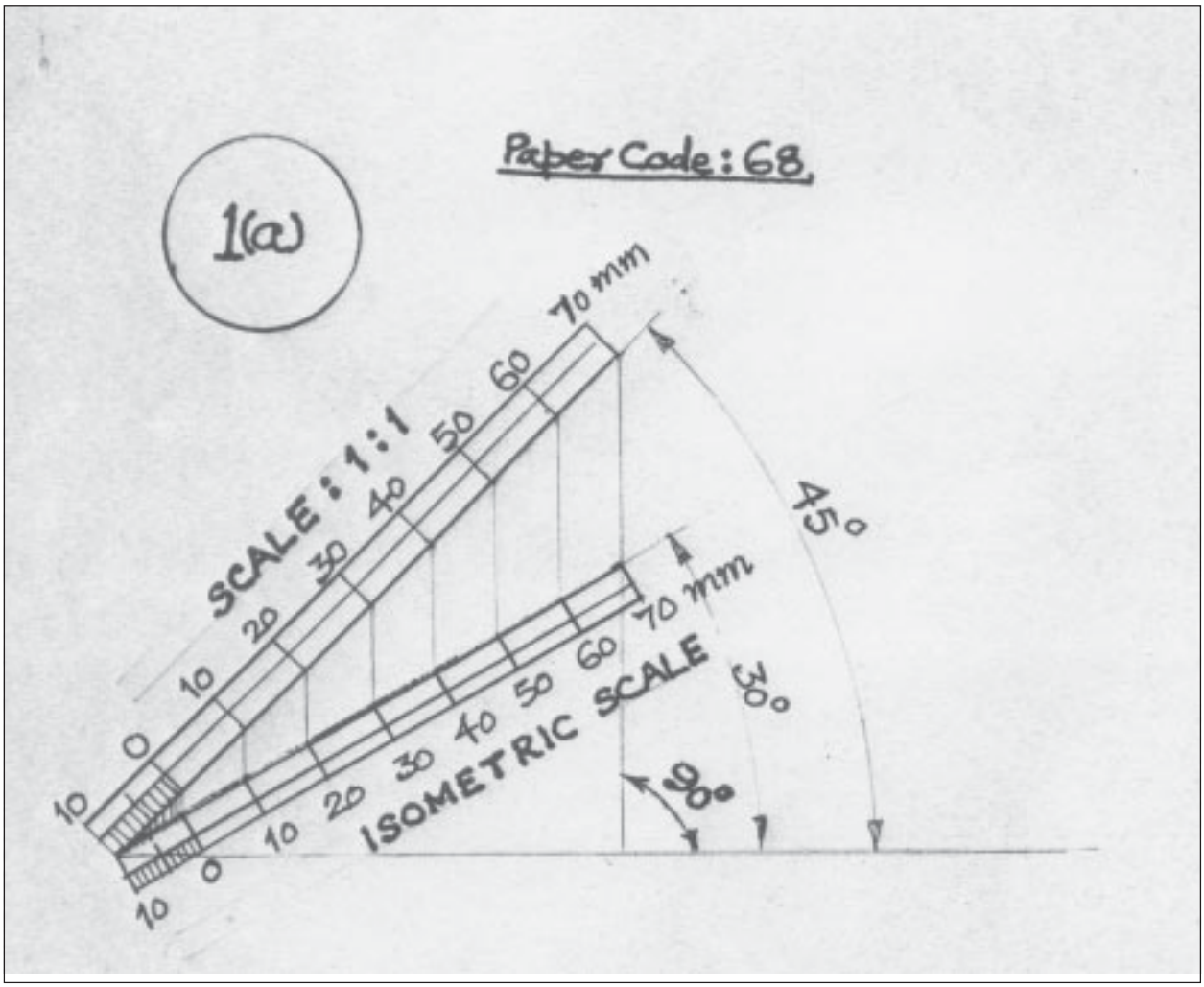
(i) Drawing entire boundary 2

(ii) Horizontal dark line for R20, axis and hatching lines 1½

(iii) Neatness and line work 1

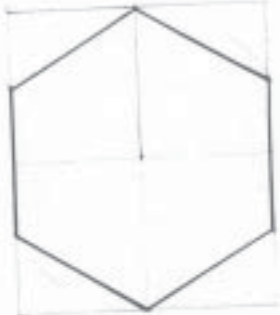
DETAILS **(6)**

Titles of both (2), scale used (1), projection symbol (1) and eight dimensions (2)


Paper Code: 68
1(a)
SCALE : 1 : 1
70 mm
45°
70 mm
30°
90°
ISOMETRIC SCALE
10
0
10
20
30
40
50
60
70
10
0
10
20
30
40
50
60
70
10

Paper Code: 6B

1(b)

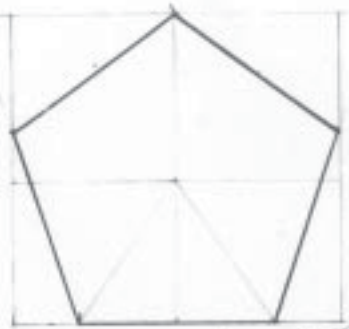


Helping View

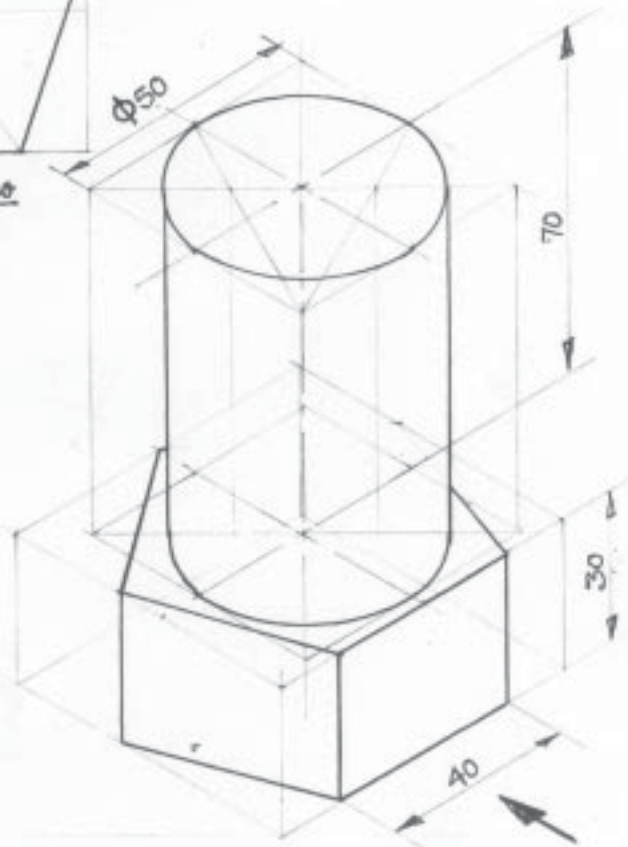
ISOMETRIC PROJECTION

Paper Code: 6B

1(c)



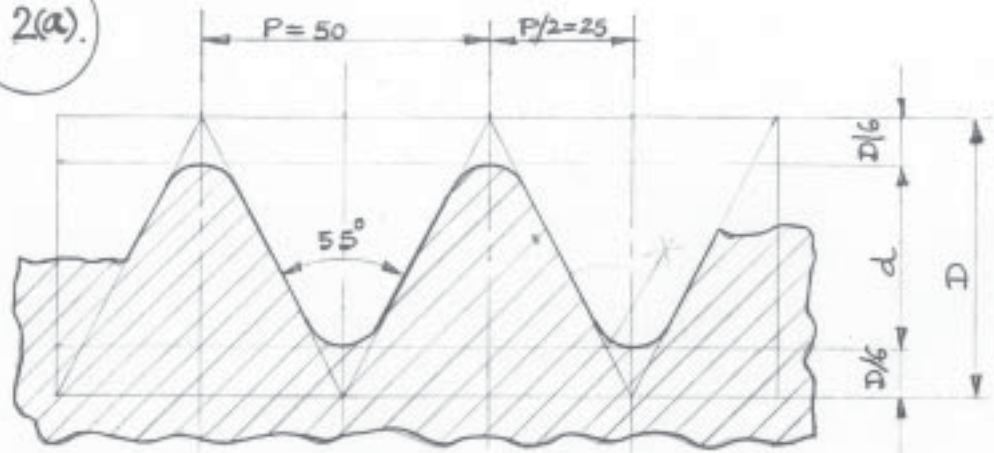
Helping View



ISOMETRIC PROJECTION

Paper Code : 68

2(a).

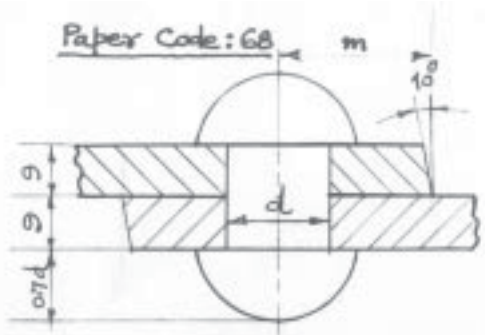


B.S.W. THREAD

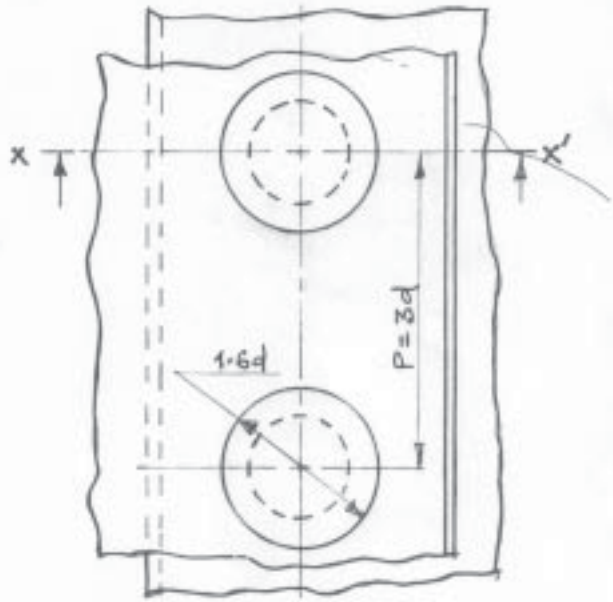
D	d
0.96 P	0.64 P

d = 6√E	18
0.7d	12.6
1.6d	28.8
P	54
m = 1.5d	27

Paper Code : 68

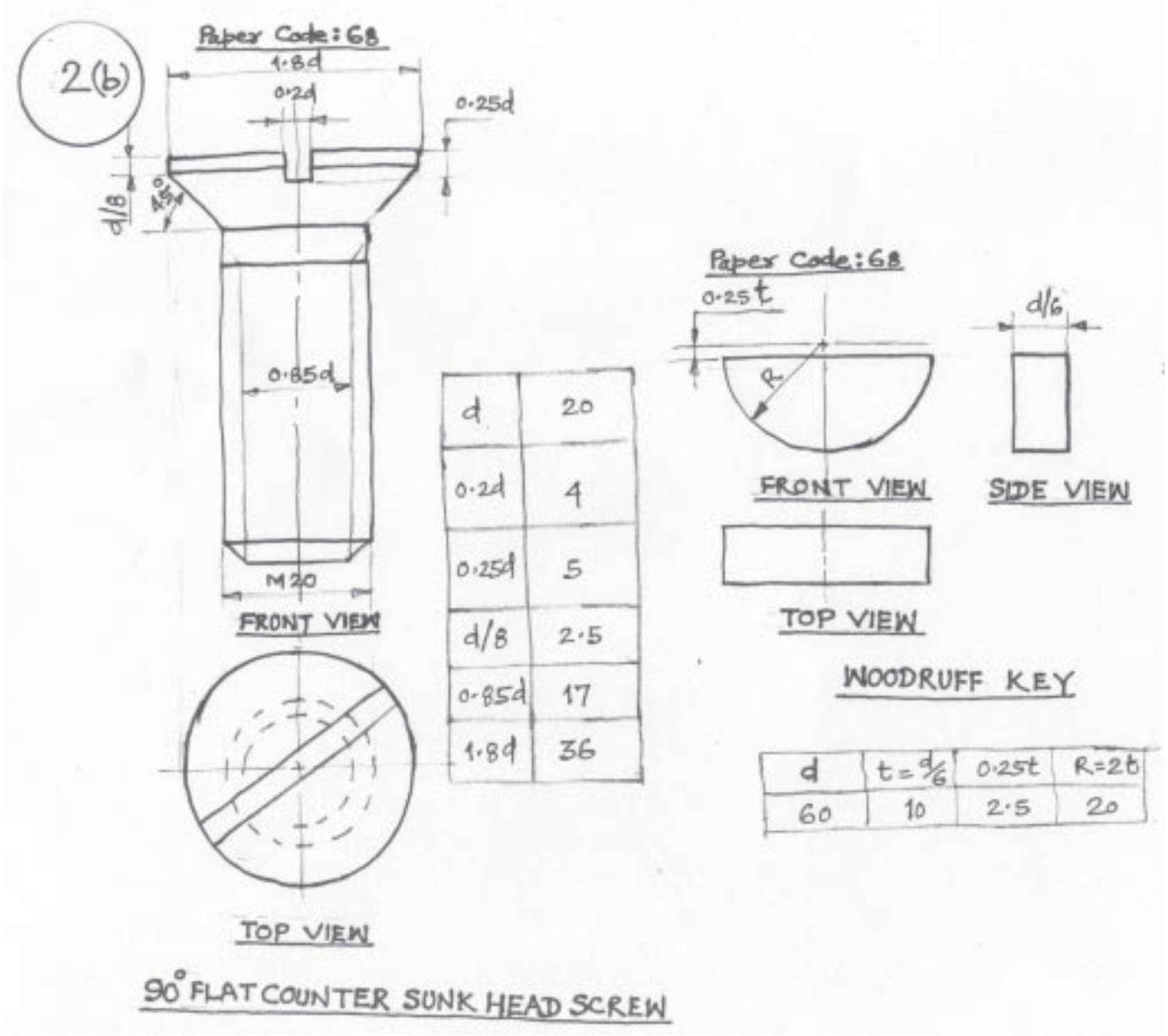


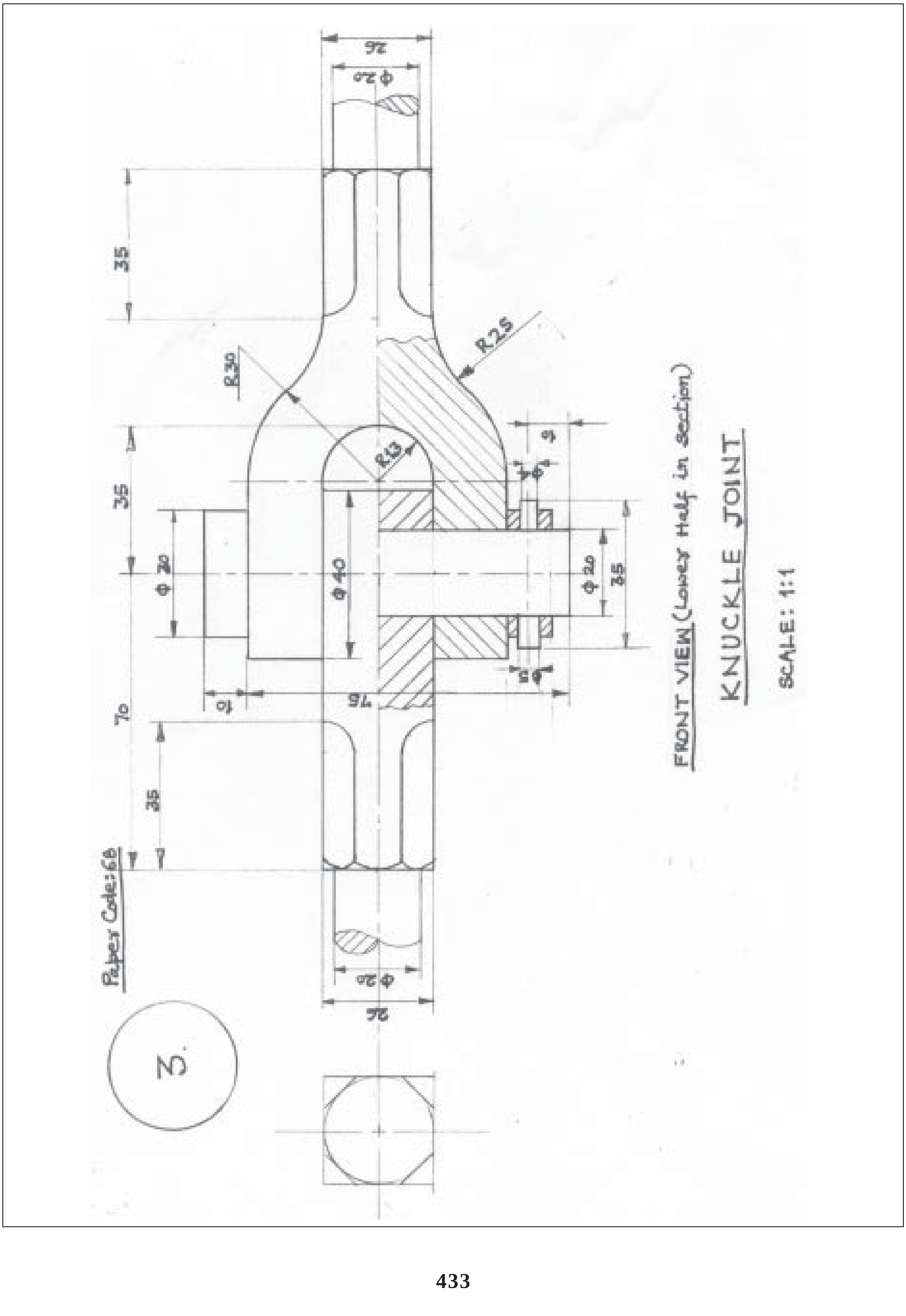
FRONT VIEW (section at x x')

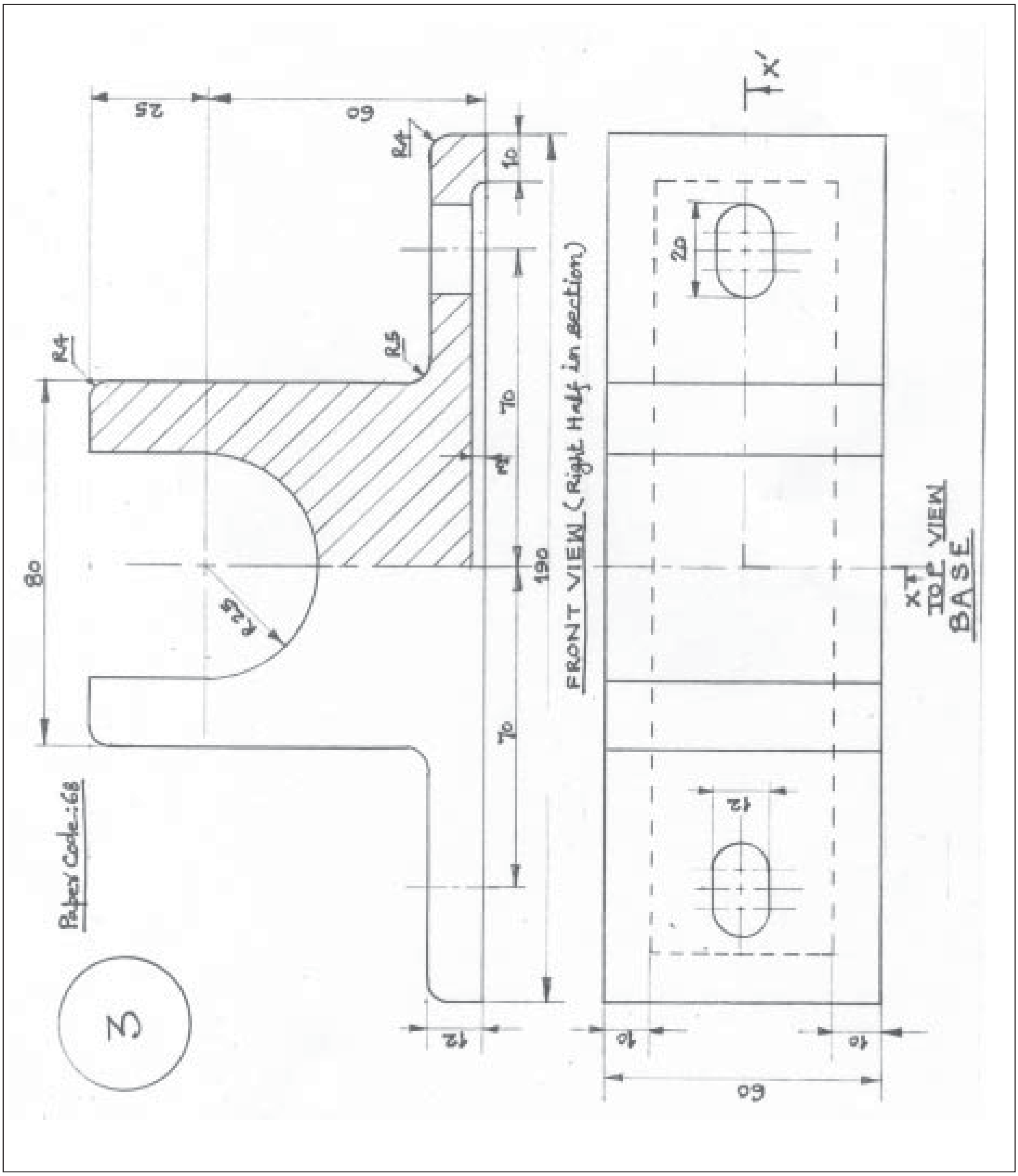


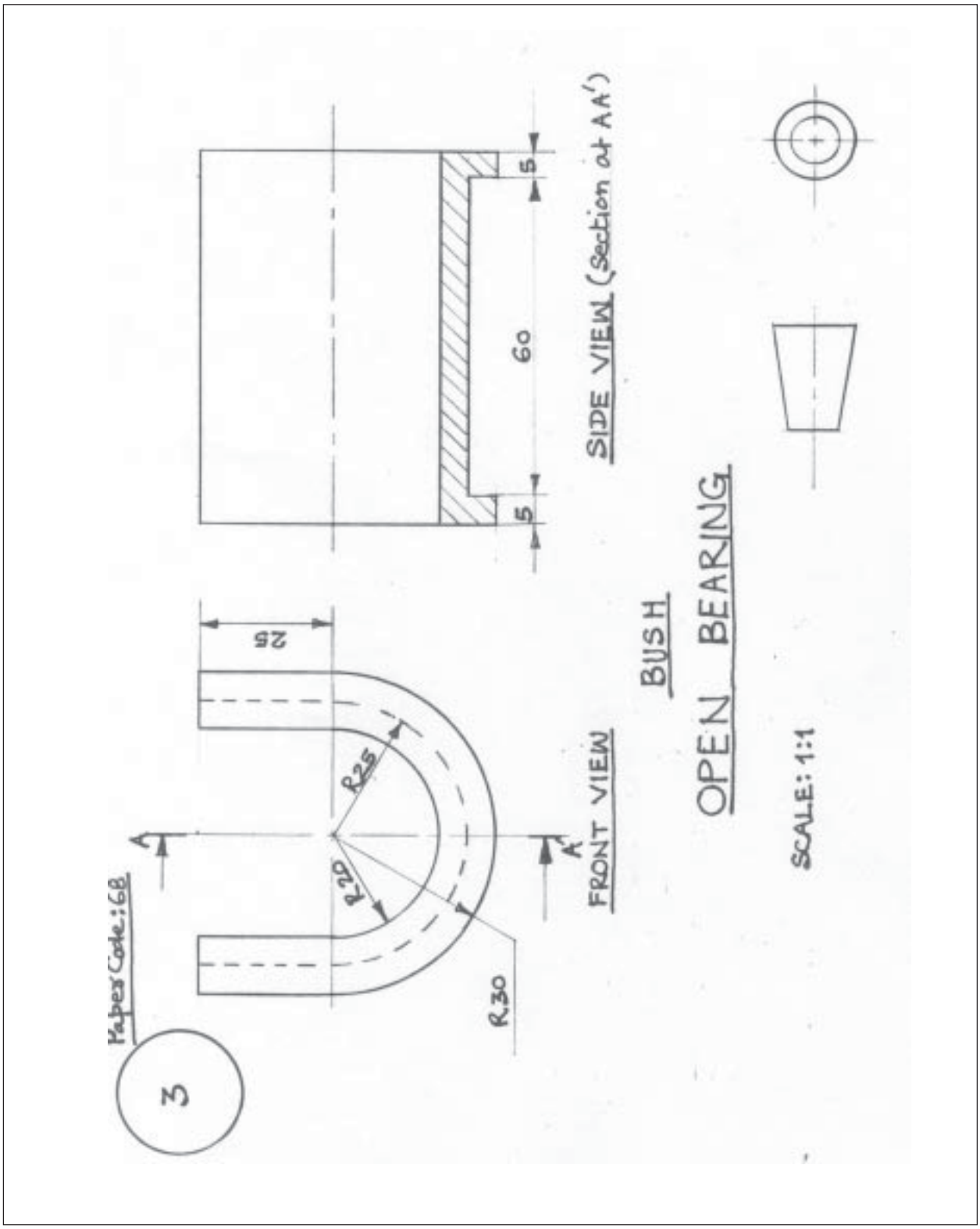
TOP VIEW

SINGLE RIVETED LAP JOINT


2(b)
Paper Code: 68
1.8d
0.2d
0.25d
d/8
45°
0.85d
M20
FRONT VIEW
TOP VIEW
90° FLAT COUNTER SUNK HEAD SCREW
d | 20
0.2d | 4
0.25d | 5
d/8 | 2.5
0.85d | 17
1.8d | 36
Paper Code: 68
0.25t
d/6
R
FRONT VIEW
SIDE VIEW
TOP VIEW
WOODRUFF KEY
d | t = d/6 | 0.25t | R = 2b
60 | 10 | 2.5 | 20


FRONT VIEW (Lower Half in Section)
KNUCKLE JOINT
SCALE: 1:1
Paper Code: 68
R30
R25
R13
φ 40
φ 20
φ 20
75
35
35
70
35
26
φ 20
26
φ 20
10
35
φ5
9


FRONT VIEW (Right Half in Section)
TOP VIEW
BASE
Paper Code: 68
3


Helper's Code: 68
3
A
A'
R30
R20
R25
25
FRONT VIEW
5
60
5
SIDE VIEW (Section at AA')
BUSH
OPEN BEARING
SCALE: 1:1