

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).

QUESTION PAPER CODE 68/1

1. (a) Construct an isometric scale. 4
- (b) Construct an isometric projection of a frustum of a hexagonal pyramid, base side = 30 mm, top side = 25 mm and axis height = 50 mm. When resting on H.P. on its base, one of the base sides is parallel to V.P. and the axis is perpendicular to H.P. Give all dimensions. 9
- (c) A pentagonal prism with side of the pentagonal base = 40 mm and height of axis = 30 mm, is resting on H.P. on its base, with one of its sides normal to V.P. On the top pentagonal-end, a cylinder of 50 mm diameter base and height 70 mm, is centrally placed with its circular base on it. Taking their common axis perpendicular to H.P., draw the isometric projection of the solids. Give all dimensions. 12
2. (a) Draw to scale 1:1, the plan and front view of a hexagonal nut, taking its nominal diameter as 25 mm, keeping its axis perpendicular to H.P. and two opposite sides of the hexagon parallel to V.P. Give standard dimensions. 9

OR

Draw to scale 1:1, the standard profiles of a square thread and a knuckle thread, taking pitch as 40 mm for each. Give standard dimensions.

- (b) Sketch freehand the front view and top view of a collar stud, keeping the axis perpendicular to H.P. Take nominal diameter as 20 mm. Give standard dimensions. 6

OR

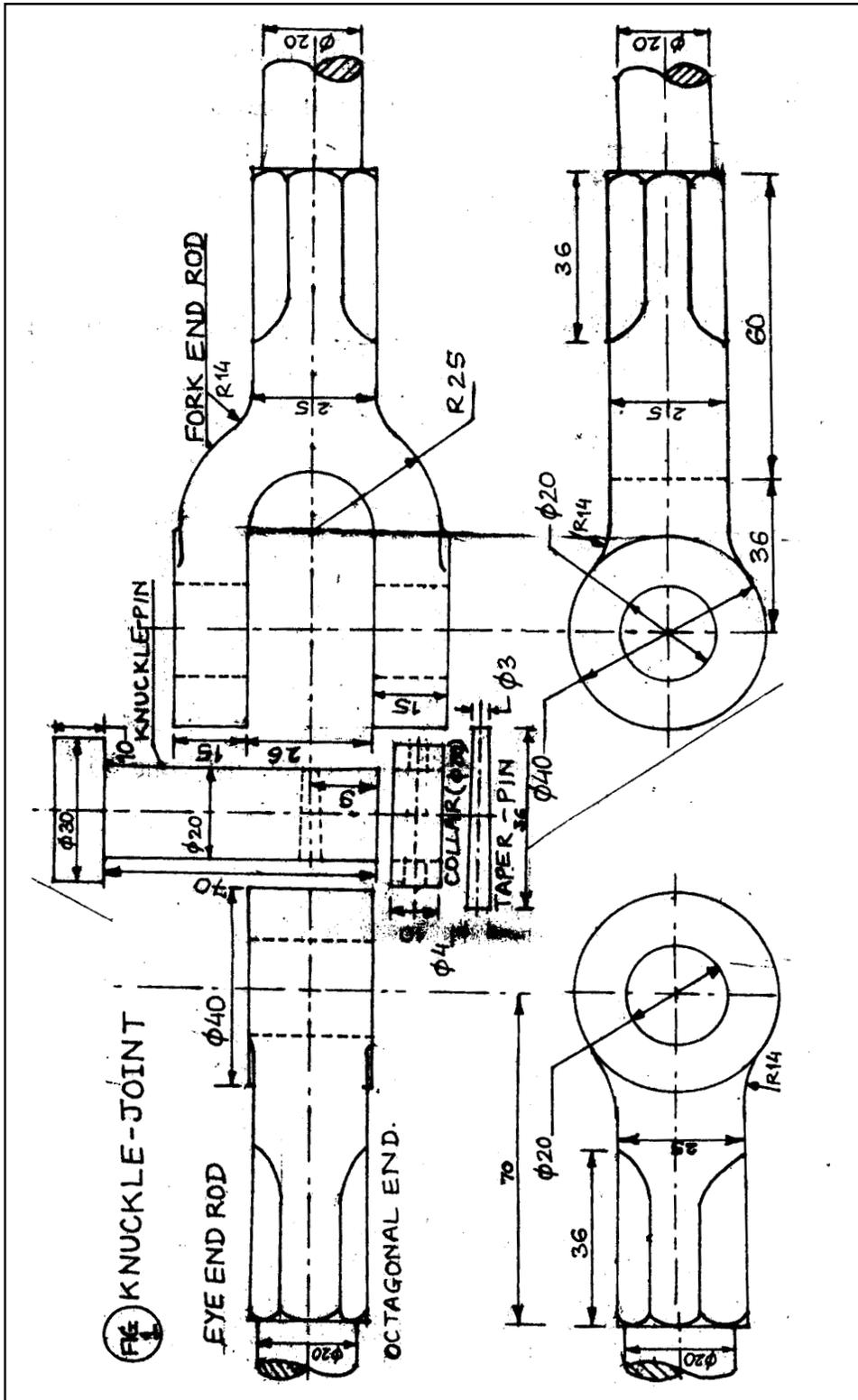
Keeping the axis vertical, sketch freehand the front view and plan of a pan-head rivet without tapeitd neck. Take diameter as 20 mm. Give standard dimensions.

3. Figure 1 shows the parts of a knuckle joint. Assemble these parts correctly and then draw the front view, full in section, to a scale full size.

25

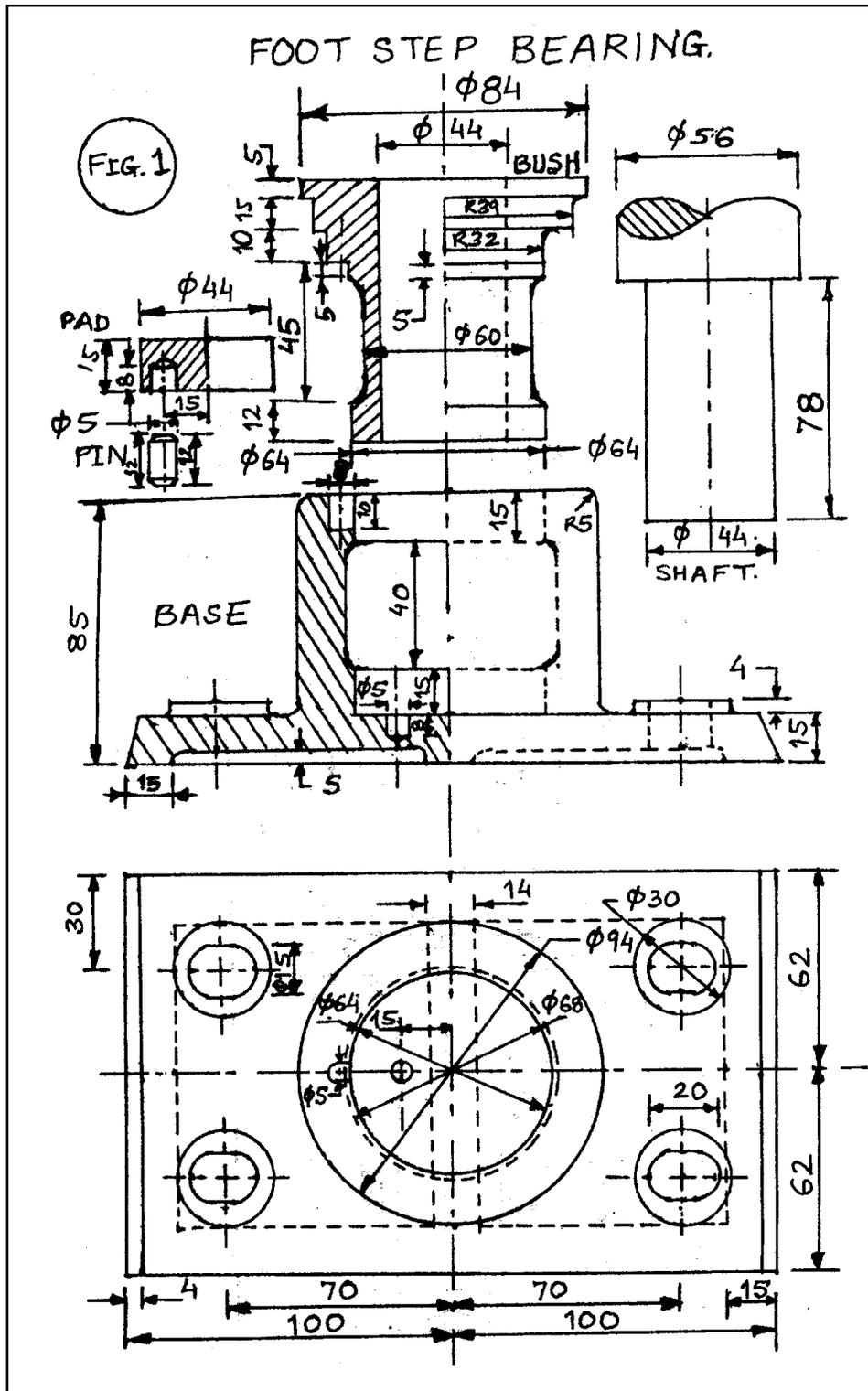
Print title and scale used. Give six important dimensions.

5



QUESTION PAPER CODE 68

1. (a) Construct an isometric scale. 4
- (b) Construct an isometric projection of a frustum of a pentagonal-pyramid, base-side = 40 mm, top-side = 30 mm and height of axis = 60 mm. When resting on H.P. with its base on it, one of the base-sides is perpendicular to V.P. and the axis is perpendicular to H.P. Give all dimensions. 10
- (c) A hexagonal prism with base side = 30 mm and height = 40 mm, is resting on H.P. on its hexagonal base. One of its base sides is parallel to V.P. On the top hexagonal end, a sphere of 25 mm radius is centrally placed. Taking their common axis perpendicular to H.P., draw the isometric projection of the two solids. Give all dimensions. 11
2. (a) Draw to scale 1:1, the plan and front view of a square nut, taking nominal diameter = 25 mm, keeping its axis perpendicular to H.P. and two opposite sides of the square parallel to V.P. Give standard dimensions. 9
- OR**
- Draw to scale 1 : 1, the standard profiles of a square-thread and a knuckle-thread, taking pitch = 40 mm for each. Give standard dimensions.
- (b) Sketch free-hand the front view and top view of a stud with a square-neck, keeping the axis perpendicular to H.P. Take nominal diameter = 20 mm. Give standard dimensions. 6
- OR**
- Sketch free-hand the front view and plan of a double-head feather key with gib head on both the ends, keeping its length parallel to H.P. and V.P. for a shaft of diameter = 48 mm. Give standard dimensions.
3. Figure 1 shows the parts of a foot-step bearing. Assemble these parts correctly and then draw the front view, left half in section to a scale full-size. 25
- Print title and scale used. Give 6 important dimensions. 5



OR

Figure 2 shows the parts of a gib and cotter joint for square rods. Assemble these parts correctly and then draw the following views to a scale full-size :

(a) Front view, upper half in section

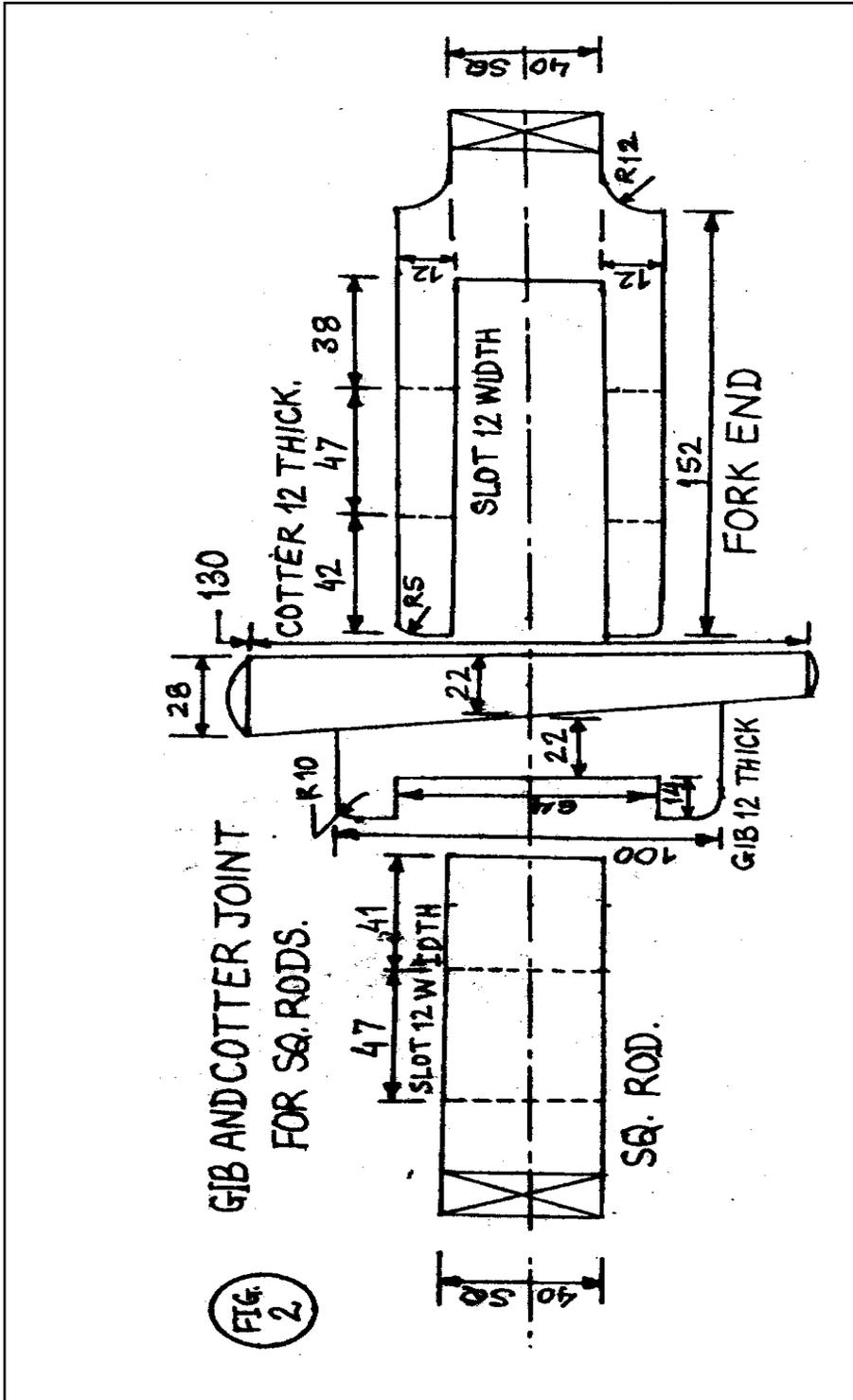
18

(b) Plan

7

Print title and the scale used. Draw the projection symbol. Give 6 important dimensions.

5



Marking Scheme — Engineering Drawing

Notes :

- (i) Marks are to be awarded in proportion to the work done,
- (ii) Mistakes in dimensioning upto ± 1.0 mm may be ignored,
- (iii) In dimensioning, arrow-heads of various types, as per SP-46 -1988, are usable. However, where space is too small for an arrowhead, oblique stroke or a dot may be employed.

QUESTION PAPER CODE 68/1

EXPECTED ANSWERS/VALUE POINTS

All questions are to be answered correctly and accurately

1. (a) **Isometric Scale** (4)
- (i) Marking of divisions of 10 mm and 1 mm on true scale ½
 - (ii) Marking angles of 30° and 45° ½
 - (iii) Projections from scale 1:1 to get points on isometric scale ½
 - (iv) Construction of isometric scale with main divisions of 10 mm each 1
 - (v) Division of 1st part into 10 divisions. 1
 - (vi) Printing 'Scale 1:1' and 'Isometric Scale' ½
- (b) **Isometric projection of a frustum of hexagonal pyramid.** (9)
- (i) Helping view [with isometric scale or scale 1:1] 2
 - (ii) Drawing isometric hexagons 3½
 - (iii) Drawing slant edges 2
 - (iv) Three dimensions, including that of axis through in-centers 1½
- Note: For incorrect position of the frustum, like keeping its axis \perp V.P. in place of \perp H.P. as asked, 3 marks should be deducted. Also, in the helping view, if a side of the base is taken \perp V. P. 2 marks should be deducted.**
- (c) **Cylinder placed, centrally, on a pentagonal prism.** (12)
- PENTAGONAL PRISM** (5)
- (i) Helping view of pentagon with a side normal to V.P. 1
 - (ii) Drawing isometric pentagons. 2
 - (iii) Drawing face edges parallel to vertical axis. 1
 - (iv) Dimensioning edge of base and axis 1

	CYLINDER	(7)
	(i) Isometric ellipses	3
	(ii) 2 generators of cylinder	1
	(iii) Ensuring central location and showing common axis of two solids	1+1
	(iv) Dimensioning diameter and height	1
	Note : For incorrectly placed solids, deductions, as proposed in Q.1(b) may be used.	
		25
2.	(a) Drawing hexagonal nut (Scale 1:1)	(9)
	FRONT VIEW	(3)
	(i) Front view of hexagonal nut of nominal diameter 25 mm with four vertical lines and a horizontal line, with a height of 0.9d to d.	1
	(ii) Drawing arcs and horizontal line at the top	2
	Note: Hidden lines may not be shown	
	TOP VIEW	(4)
	(i) Distance A/F = Chamfer circle dia. of 1.5d, or (1.5d + 3mm)	1
	(ii) Indication of outer thin and broken circle of dia. 25	1
	(iii) Indication of inner thick full circle of dia. 25x.85	1
	(iv) Hexagon circumscribed on chamfer circle.	1
	DETAILS	
	(i) Line work and dimensions	
	(ii) [Diameter of bolt, Root diameter, R or 60 ° angle, height, A/F]	(2)
		9
	[OR]	
	Square thread profile, drawn to scale 1:1	(4)
	(i) Construction of thread profile with hatching lines	2 + 1
	(ii) Dimensioning pitch, depth and angle	1
	Knuckle thread profile, drawn to scale 1:1	(5)
	(i) Construction of thread profile with hatching lines	3 + 1
	(ii) Dimensioning pitch, depth and radius	1
	Note : 3 marks may be deducted in all if profiles are sketched freehand and not drawn to scale.	
(b)	Following components are to be sketched freehand proportionately:	
	COLLAR STUD	(6)
	(i) Front view with its axis \perp H.P.	4
	(ii) Top view	1
	(iii) Dimensions	1

[OR]

PAN-HEAD RIVET (6)

- | | |
|---|-----------|
| (i) Front view with its axis \perp H.P. | 4 |
| (ii) Top view | 1 |
| (iii) Dimensions | 1 |
| | <hr/> |
| | 15 |

Note: 2 marks may be deducted, in all, if these components are drawn to scale 1:1 instead of being sketched freehand.

3. KNUCKLE JOINT (30)

- | | |
|--|----|
| (i) Fork-front view full in section | 10 |
| (ii) Single eye end (positioned correctly), drawn full in section | 5 |
| (iii) Knuckle pin (fitted and positioned correctly) | 4 |
| (iv) Collar- positioned correctly with hatching lines as per conventions | 3 |
| (v) Taper pin positioned correctly | 2 |
| (vi) Line work | 1 |

DETAILS (5)

- | | |
|-----------------------------------|-----|
| (i) Printing title and scale used | 1+1 |
| (ii) Six dimensions | 30 |

FLANGE COUPLING (UNPROTECTED):

Following views are to be drawn correctly and accurately to scale 1:1

FRONT-VIEW (15)

- | | |
|---|---|
| (i) Flanges : | |
| Upper half in section with hatching lines | 5 |
| Lower half without section | 3 |
| (ii) Shafts: | |
| Positioned correctly with hatching lines | 2 |
| (iii) Keys (fitted in position) | 2 |
| (iv) Bolts and Nuts , positioned and drawn correctly | 3 |

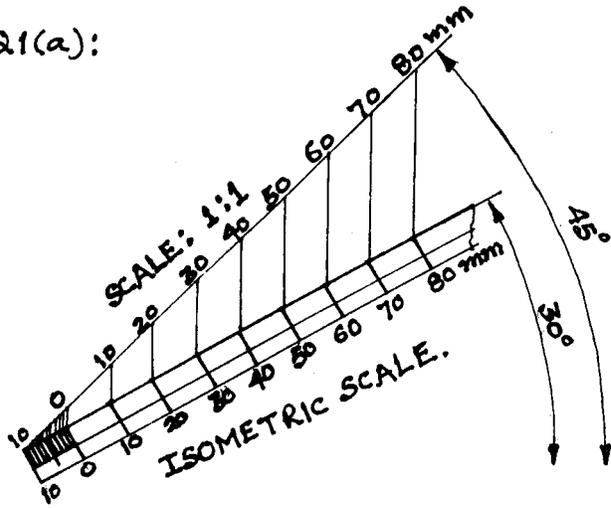
SIDE-VIEW (10)

- | | |
|--|-----|
| (i) 5 circles, drawn correctly, with hatching lines in shaft | 5+1 |
| (ii) Keys drawn properly | 1 |
| (iii) Bolts and nuts | 3 |

DETAILS (5)

- | | |
|--|-----------|
| (i) Printing title, scale used and projection symbol | 3 |
| (ii) Six dimensions | 2 |
| | <hr/> |
| | 30 |

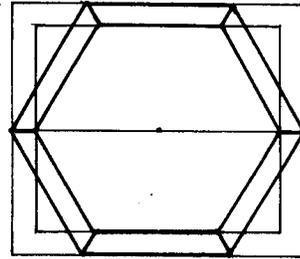
Q1(a):



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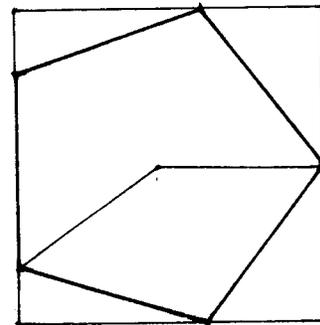
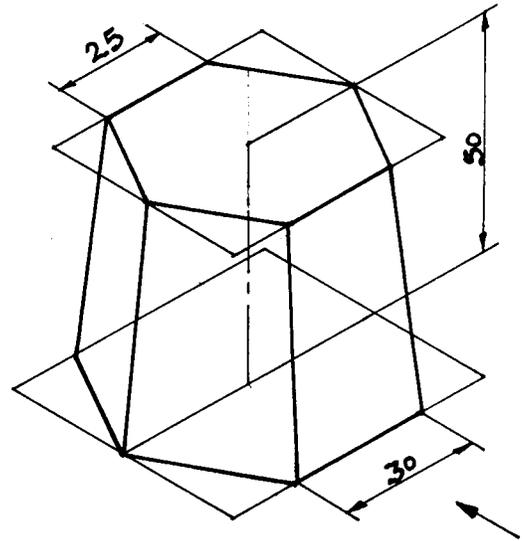
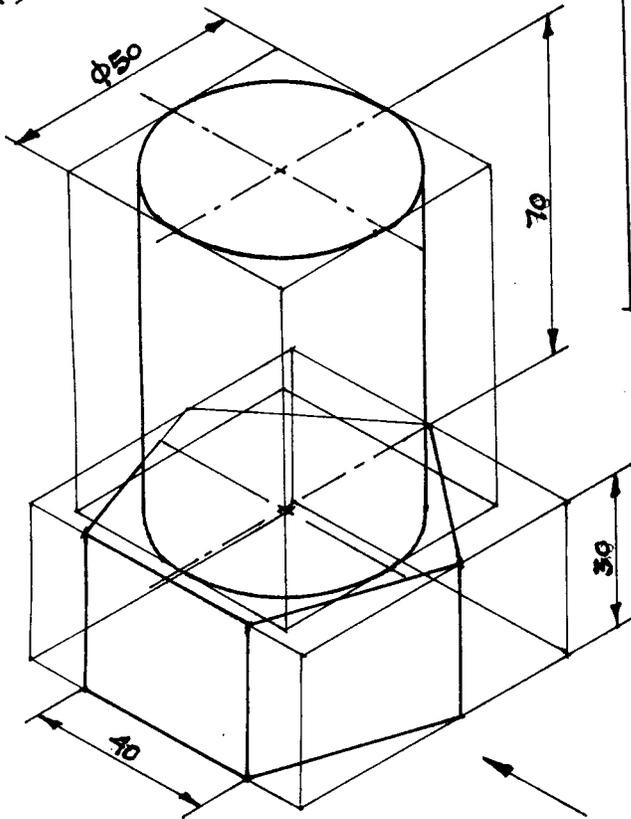
68/1

Q1(b):

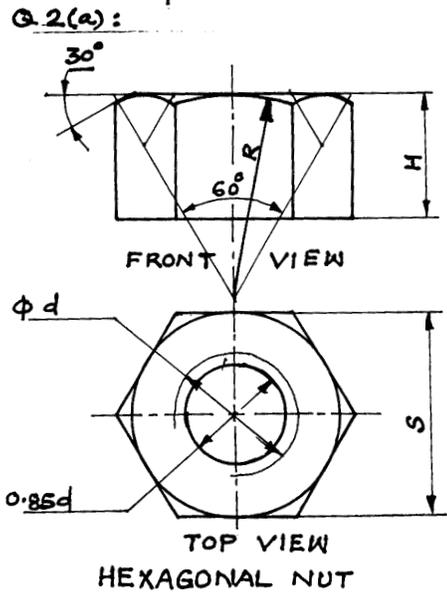
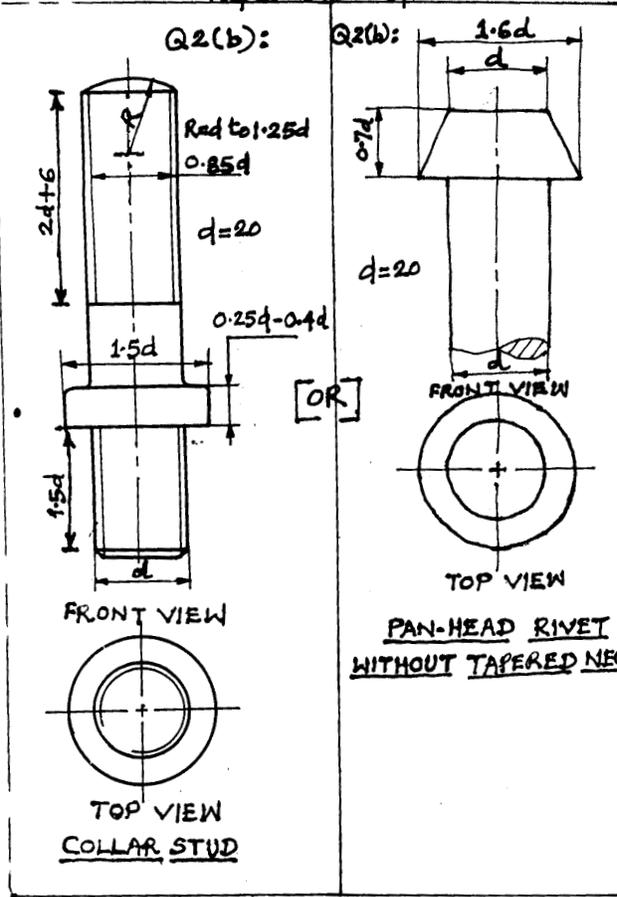


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Q1(c):

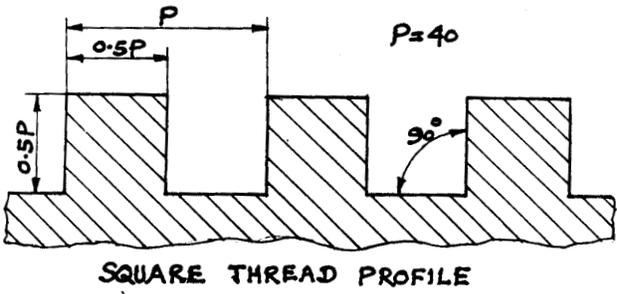
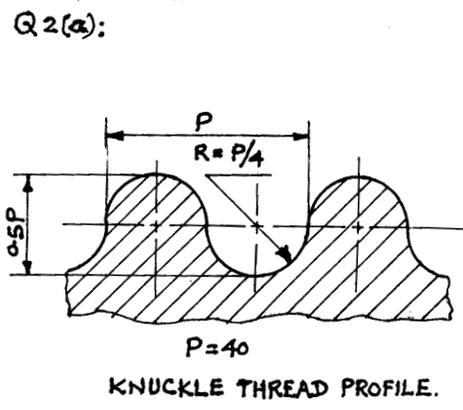


Helping view



$d = 25$
 $H = 0.9d$ to d
 $S = 1.5d$ to $1.5d + 3$ [OR $2d$ method for hex.]
 $R = 1.2d$ to $1.5d$ [OR $60^\circ L$ method]
Hidden lines may be omitted.

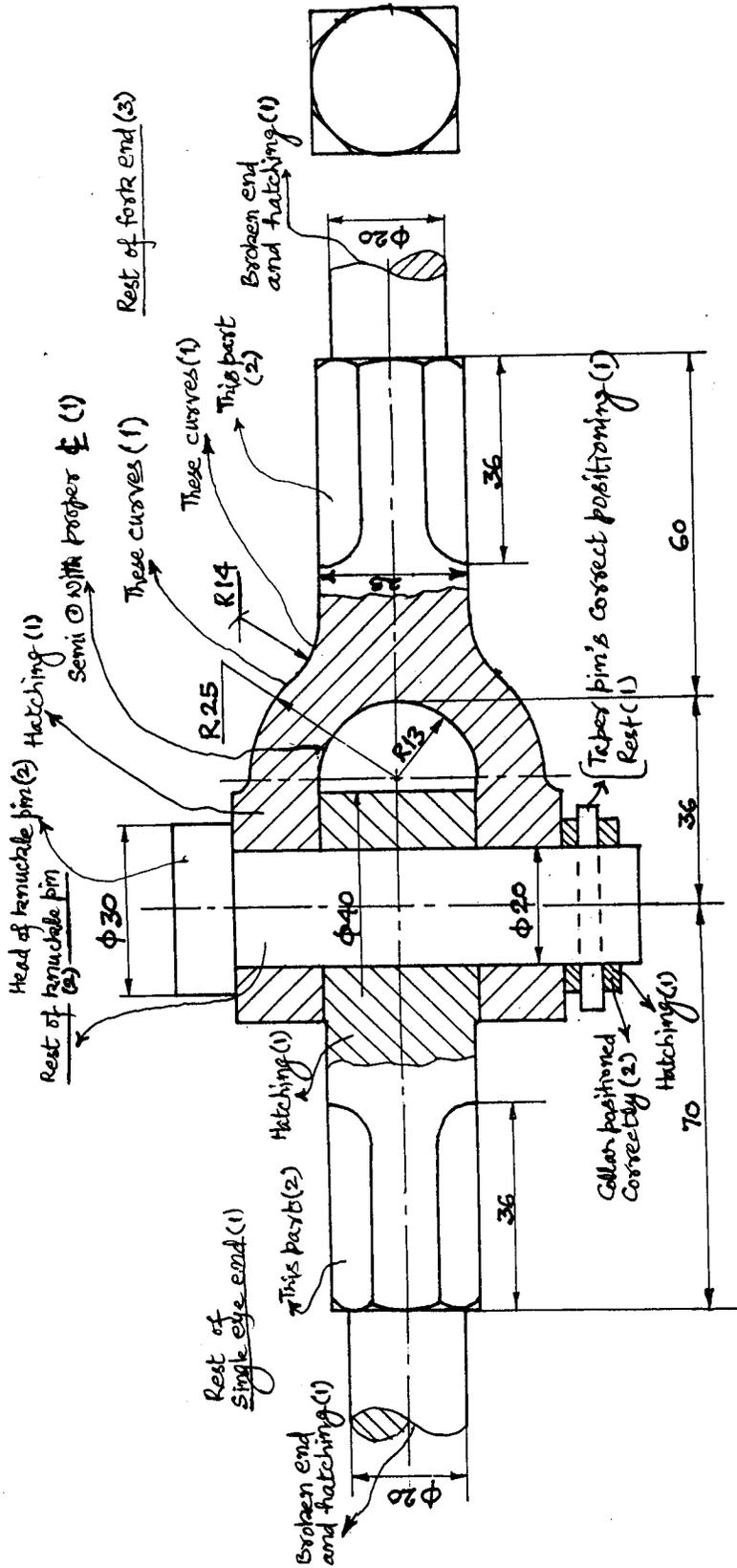
[OR]



BREAK-UP OF MARKING
SCHEME

Paper Code No. 68/1

Q.3



FRONT VIEW (full in section)

KNUCKLE JOINT

QUESTION PAPER CODE 68

EXPECTED ANSWERS/VALUE POINTS

All questions are to be answered correctly and accurately.

- | | | |
|----|--|-----------|
| 1. | (a) Isometric Scale | (4) |
| | (i) Marking of divisions of 10 mm and 1 mm on true scale | ½ |
| | (ii) Marking angles of 30° and 45° | ½ |
| | (iii) Projections from scale 1:1 to get points on isometric scale | ½ |
| | (iv) Construction of isometric scale with main divisions of 10 mm each | 1 |
| | (v) Division of 1 st part into 10 divisions. | 1 |
| | (vi) Printing 'Scale 1:1' and 'Isometric Scale' | ½ |
| | (b) Isometric projection of a frustum of Pentagonal Pyramid. | (10) |
| | (i) Helping view [with isometric scale or scale 1:1] | 2 |
| | (ii) Drawing isometric pentagons | 4 |
| | (iii) Drawing slant edges | 1½ |
| | (iv) Axis | 1 |
| | (v) Dimensions | 1½ |
| | Note: For incorrect position of the frustum, like keeping its axis — V.P. in place of — H.P. as asked, 3 marks should be deducted. Also, in the helping view, if a side of the base is taken parallel to V.P. instead of perpendicular to V.P., 2 marks should be deducted. | |
| | (c) Sphere placed, centrally, on a hexagonal prism. | (11) |
| | HEXAGONAL PRISM | (6½) |
| | (i) Helping view | 1 |
| | (ii) Drawing isometric Hexagons. | 2½ |
| | (iii) Drawing face edges. | 2 |
| | (iv) Dimensioning | 1 |
| | SPHERE | (4½) |
| | (i) Central placement and common vertical axis | 1 |
| | (ii) Location of centre of sphere with isometric scale | 1 |
| | (iii) Drawing circles of sphere to scale 1:1 | 1 ½ |
| | (iv) Dimensioning | 1 |
| | | 25 |
| 2. | (a) Drawing Square Nut (Scale 1:1) | (9) |
| | FRONT VIEW | (3) |
| | (i) Front view of square nut of nominal diameter 25 mm with six vertical lines and two horizontal lines, with a height of 0.8d to d. | 2 |
| | (ii) Drawing arc with radius 1.5d or 2d | 1 |

TOP VIEW	(4)
(i) Distance A/F = Chamfer dia. of $1.5d + 3\text{mm}$	1
(ii) Indication of outer thin and broken circle of dia. $2.5d$	1
(iii) Indication of inner thick full circle of dia. $2.5 \times 0.85d$	1
(iv) Circumscribed Square	1

DETAILS	(2)
(i) Line work and dimensions [Diameter of bolt, Root diameter, R or 60° angle, height, A/F]	

[OR]

Square thread profile, drawn to scale 1:1 **(4)**

(i) Construction of thread profile with hatching lines	2 + 1
(ii) Dimensioning pitch, depth and angle	1

Knuckle thread profile, drawn to scale 1:1 **(5)**

(i) Construction of thread profile with hatching lines	3 + 1
(ii) Dimensioning pitch, depth and radius	1

Note : 3 marks may be deducted, in all, if profiles are sketched freehand and not drawn

(b) Following components are to be sketched freehand proportionately:

PLAIN STUD WITH SQUARE NECK **(6)**

(i) Front view with its axis \perp H.P.	3
(ii) Top view	2
(iii) Dimensions	1

[OR]

DOUBLE HEADED GIB HEAD FEATHER KEY **(6)**

(i) Front view	3
(ii) Top view	2
(iii) Dimensions	1

15

Note: 2 marks may be deducted in all, if these components are drawn to scale 1:1 instead of being sketched freehand.

3. FOOT STEP BEARING **(30)**

FRONT VIEW LEFT HALF IN SECTION **(25)**

(i) Body	
Left half in section with pin hole.	7
Right half without section	4

(ii) Bush in correct position	
Left half in section	4
Right half without section	2
(iii) Disc placed correctly in position including hatching lines and hole	3
(iv) Pin placed in the hole	1
(v) Shaft placed correctly in position with broken ends and hatching lines	2
(vi) Line work	2
DETAILS	(5)
(i) Printing title and scale used	1 + 1
(ii) Six dimensions	3
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	30
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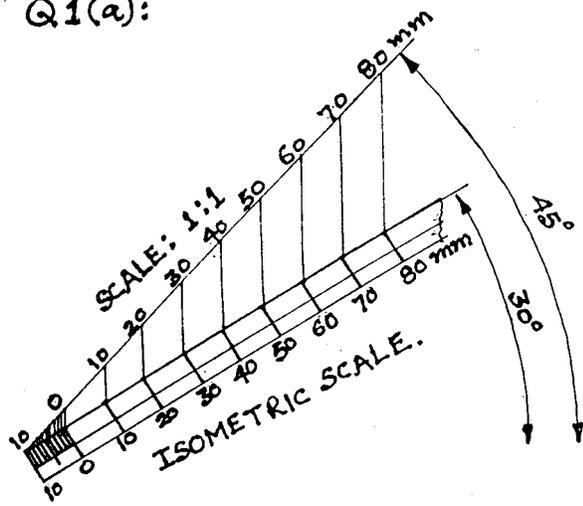
OR

GIB AND COTTER JOINT

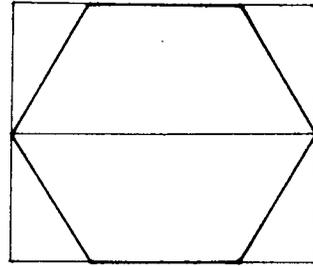
Following views are to be drawn correctly and accurately to scale 1:1

(a) FRONT-VIEW	(18)
(i) Strap (Fork End)	
Upper half in section with hatching lines	5
Lower half without section	3
(ii) Rod (Eye End)	.
Upper half in section	2
Lower half without section	1
(iii) Gib & Cotter (fitted in position)	
Upper half	3½
Lower half	2½
(iv) Line work in Front View	1
(b) TOP - VIEW	(7)
(i) Strap / Fork End with conventional break for square rods / hatching lines	2
(ii) Rod / Eye End with conventional break for square rods / hatching lines	1
(iii) Gib & Cotter details	3
(iv) Line work in top view	1
DETAILS	(5)
(i) Printing title, scale used and projection symbol	3
(ii) Six dimensions	2
	<hr/>
	30
	<hr/>

Q1(a):

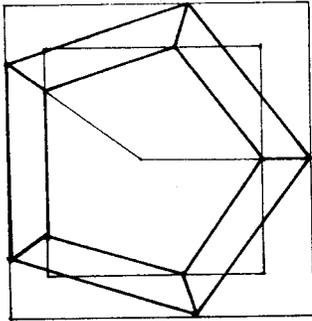


Q1(c):

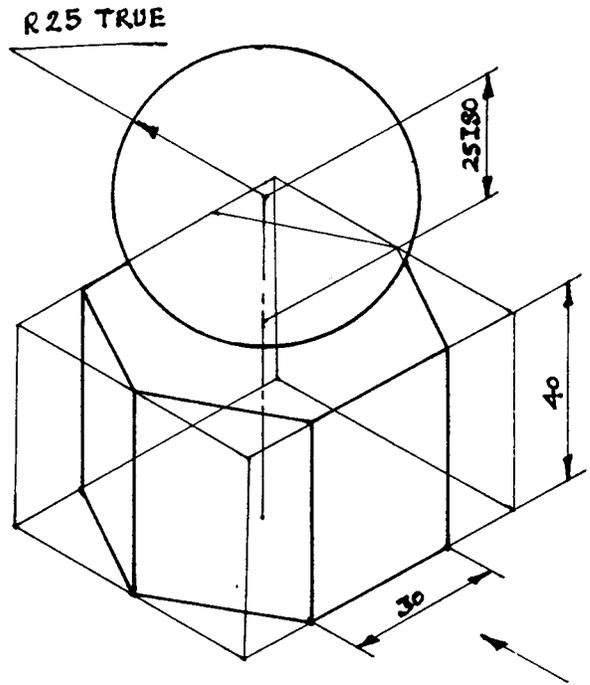
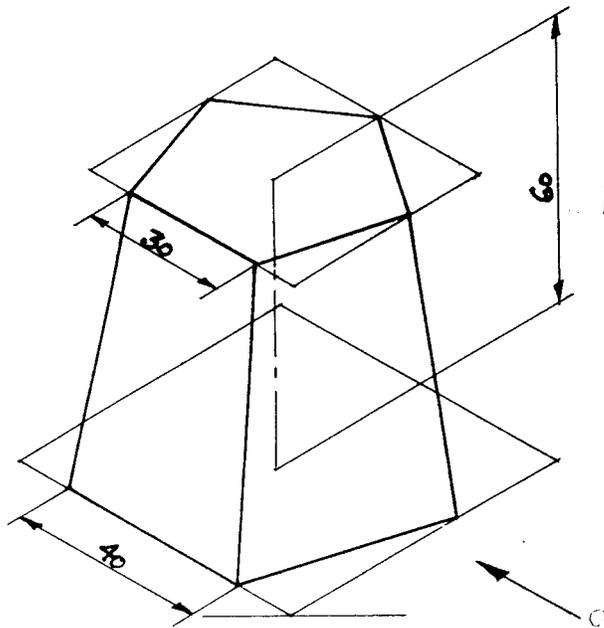


HELPING VIEW

Q1(b):

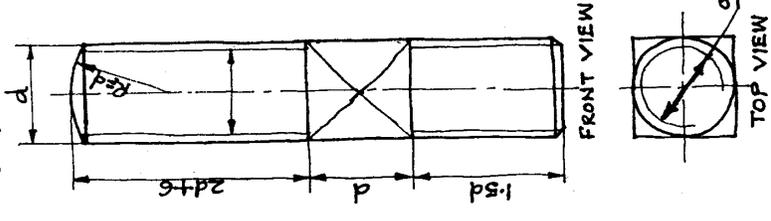


HELPING VIEW



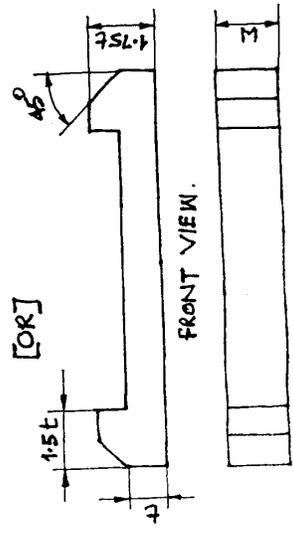
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Q.2 (b):



STUD WITH A SQUARE NECK

$d = 48,$
 $h = d/4,$
 $t = d/6.$



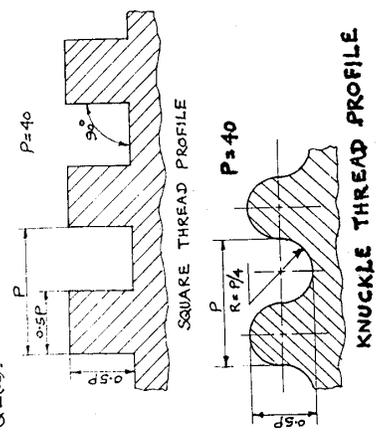
DOUBLE HEAD FEATHER KEY

Paper Code : 68

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Paper Code No. 68

Q.2 (a):



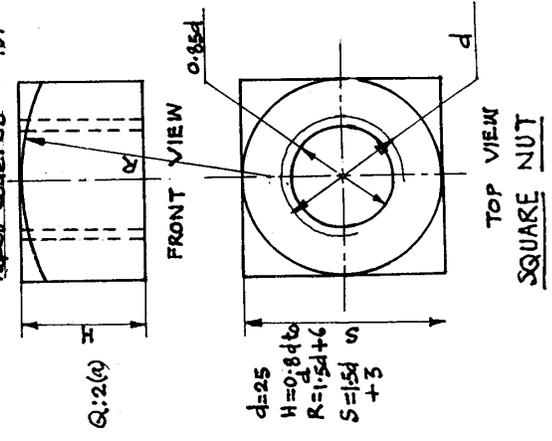
OR

[OR]

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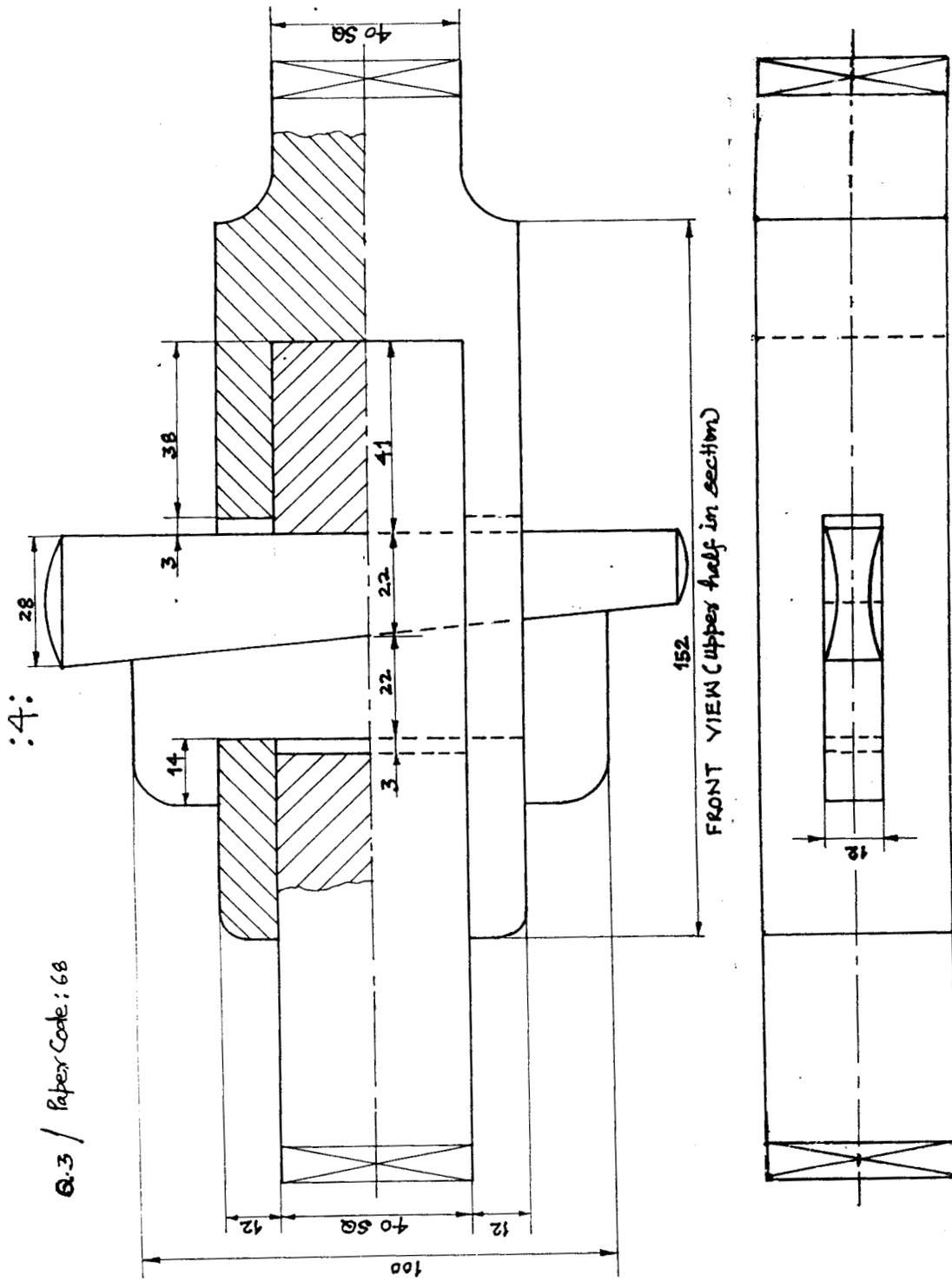
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Q.2 (a)



$d = 25$
 $H = 0.8d$
 $R = 1.5d + 6$
 $S = 1.5d + 3$

SQUARE NUT



GIB AND COTTER JOINT