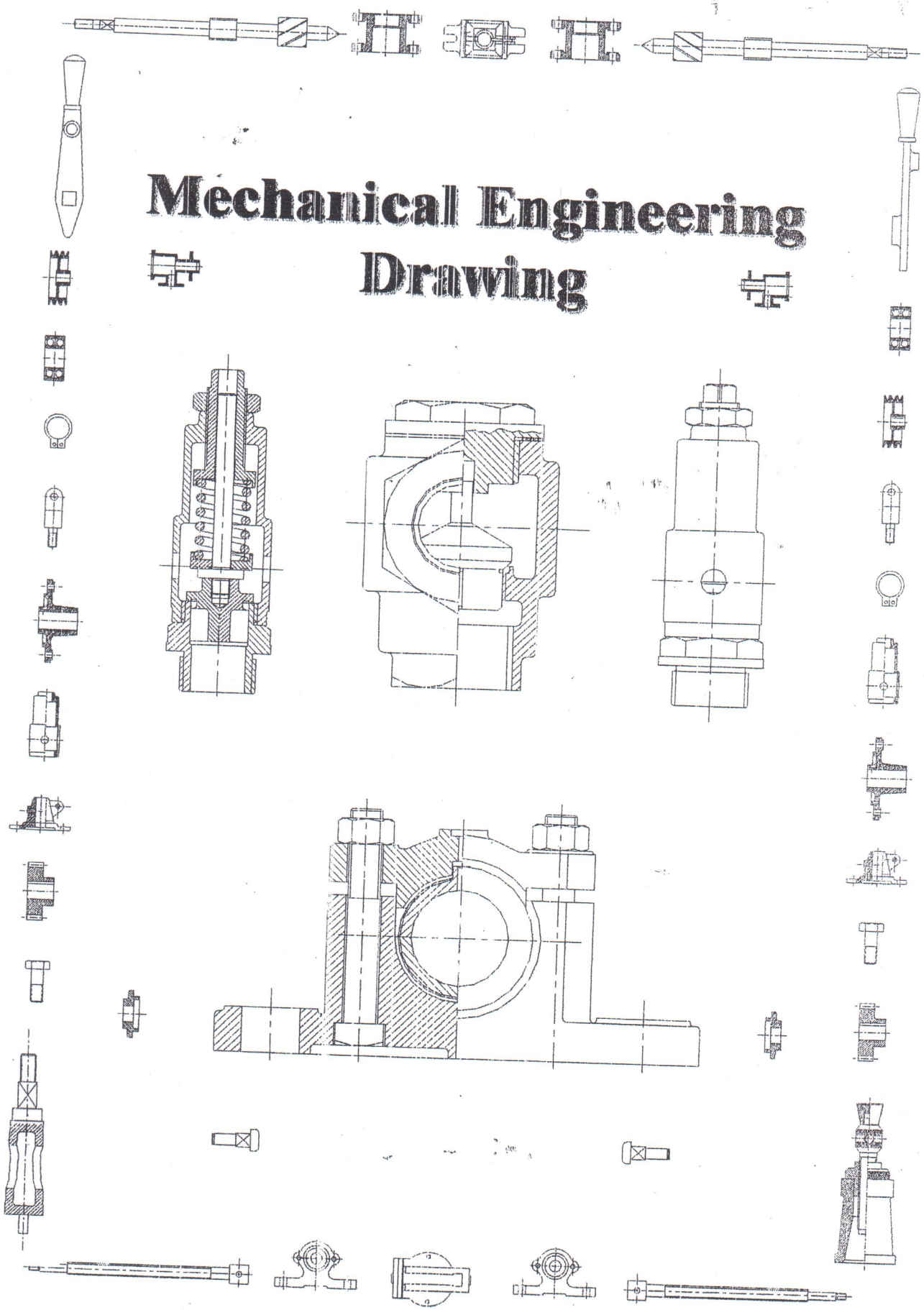
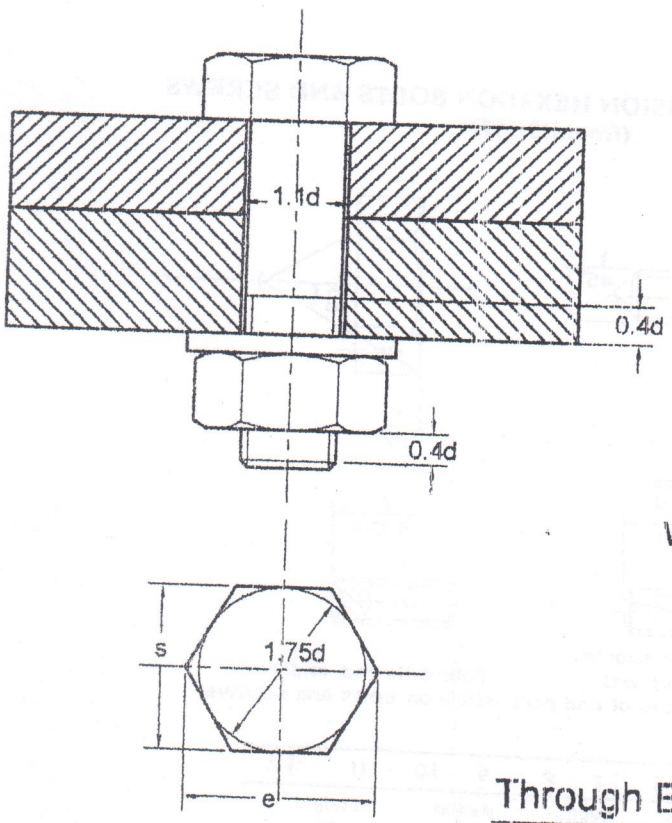
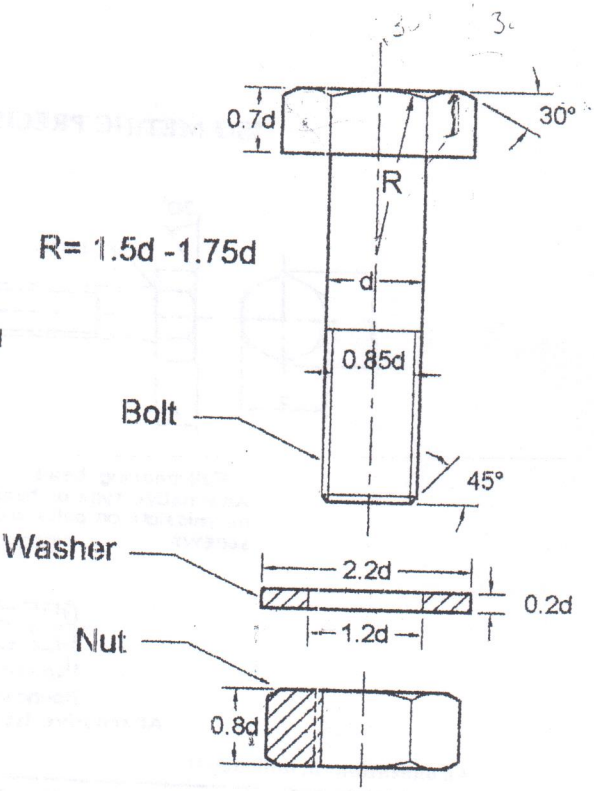
Mechanical Engineering Drawing

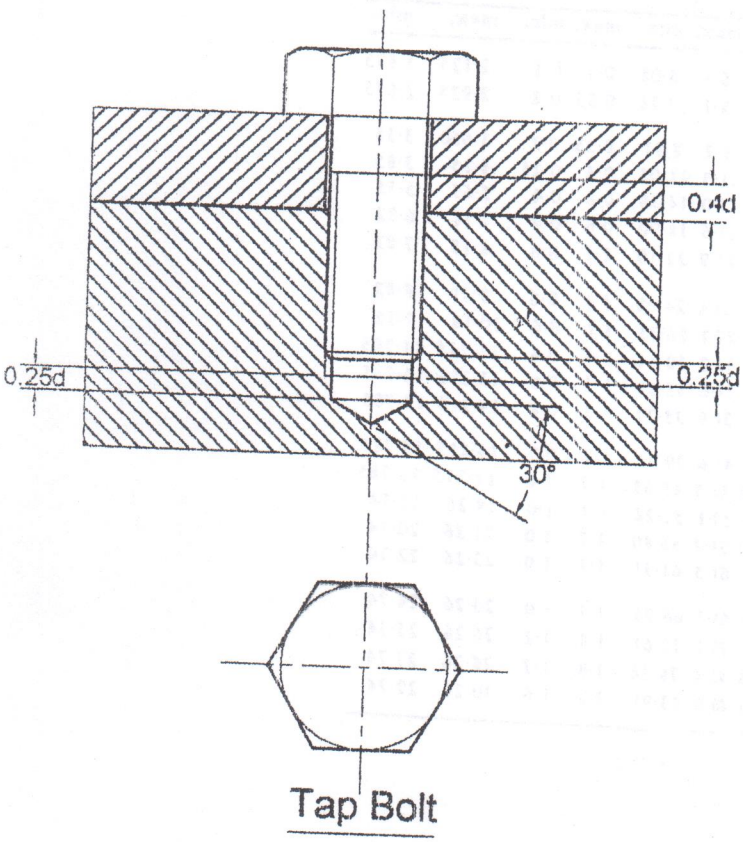


FASTENERS

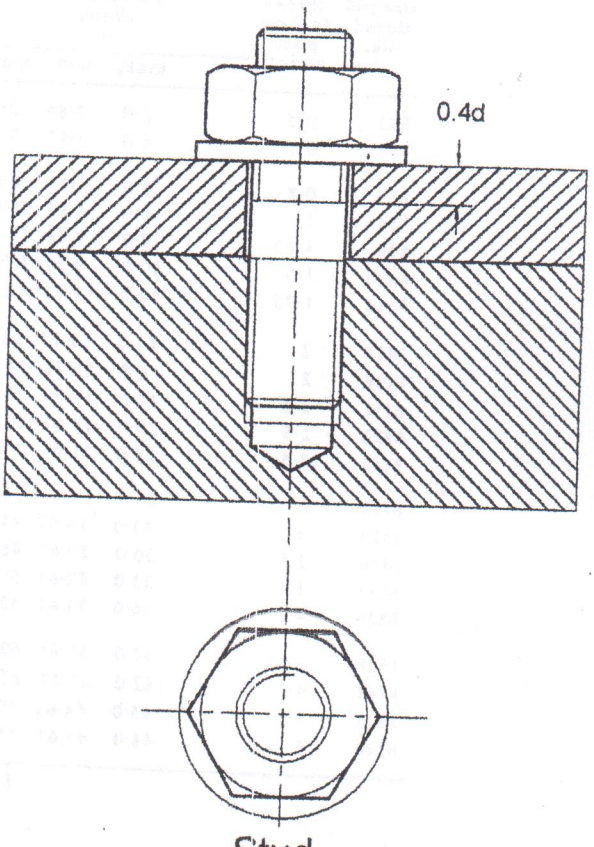


Through Bolt



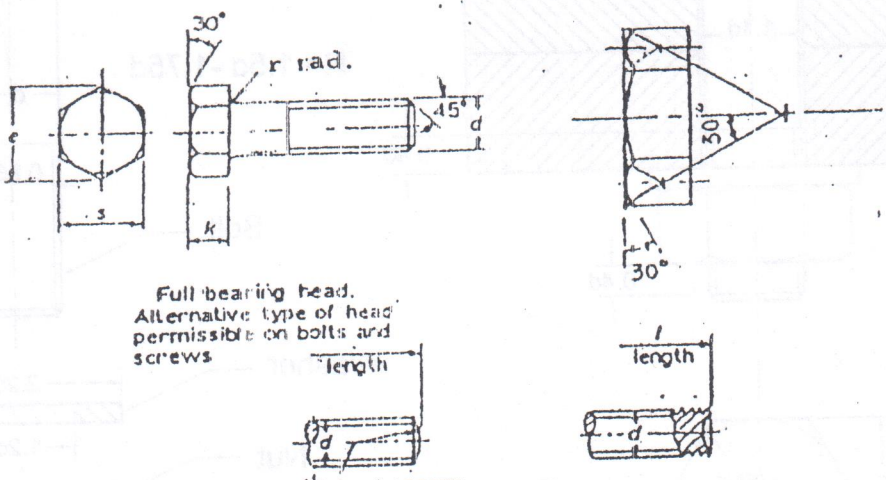


Tap Bolt



Stud

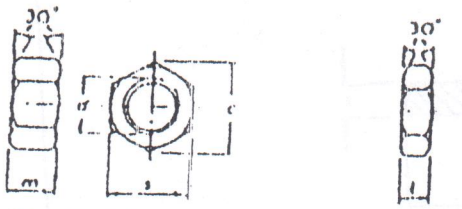
ISO METRIC PRECISION HEXAGON BOLTS AND SCREWS
(from BS 3692)



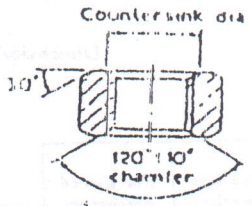
All dimensions in millimetres.

1	2	3	4	5	6	7	8	9	10	11	12
Nominal size and thread dia. d	Pitch of thread (coarse pitch series)	Diameter of unthreaded shank d		Width across flats s		Width across corners e		Radius under head r		Height of head k	
		max.	min.	max.	min.	max.	min.	max.	min.	max.	min.
M3	0·5	3·0	2·86	5·5	5·38	6·4	6·08	0·3	0·1	2·125	1·875
M4	0·7	4·0	3·82	7·0	6·85	8·1	7·74	0·35	0·2	2·925	2·675
M5	0·8	5·0	4·82	8·0	7·85	9·2	8·87	0·35	0·2	3·650	3·35
M6	1	6·0	5·82	10·0	9·78	11·5	11·05	0·4	0·25	4·15	3·85
M8	1·25	8·0	7·78	13·0	12·73	15·0	14·38	0·6	0·4	5·65	5·35
M10	1·5	10·0	9·78	17·0	16·73	19·6	18·90	0·6	0·4	7·18	6·82
M12	1·75	12·0	11·73	19·0	18·67	21·9	22·10	1·1	0·6	8·18	7·82
M14	2	14·0	13·73	22·0	21·67	25·4	24·49	1·1	0·6	9·18	8·82
M16	2	16·0	15·73	24·0	23·67	27·7	26·75	1·1	0·6	10·18	9·82
M18	2·5	18·0	17·73	27·0	26·67	31·2	30·14	1·1	0·6	12·215	11·785
M20	2·5	20·0	19·67	30·0	29·67	34·6	33·53	1·2	0·8	13·215	12·785
M22	2·5	22·0	21·67	32·0	31·61	36·9	35·72	1·2	0·8	14·215	13·785
M24	3	24·0	23·67	36·0	35·38	41·6	39·98	1·2	0·8	15·215	14·785
M27	3	27·0	26·67	41·0	40·38	47·3	45·63	1·7	1·0	17·215	16·785
M30	3·5	30·0	29·67	46·0	45·38	53·1	51·28	1·7	1·0	19·26	18·74
M33	3·5	33·0	32·61	50·0	49·38	57·7	55·80	1·7	1·0	21·26	20·74
M36	4	36·0	35·61	55·0	54·26	61·5	61·31	1·7	1·0	23·26	22·74
M39	4	39·0	38·61	60·0	59·26	69·3	66·96	1·1	1·0	25·26	24·74
M42	4·5	42·0	41·61	65·0	64·26	75·1	72·61	1·8	1·2	26·26	25·74
M45	4·5	45·0	44·61	70·0	69·26	80·8	78·26	1·8	1·2	28·26	27·74
M48	5	48·0	47·61	75·0	74·26	86·6	83·91	2·3	1·6	30·26	29·74

ISO METRIC PRECISION HEXAGON NUTS AND THIN NUTS
(from BS 3692)



Normal thickness nut Thin nut



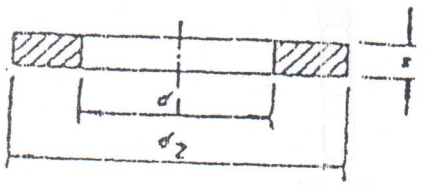
Enlarged view of nut countersink

All dimensions in millimetres.

1	2	3	4	5	6	7	8	9	10	11	12
Nominal size and thread diameter *d*	Pitch of thread (coarse pitch series)	Width across flats *s*		Width across corners *e*		Thickness of normal nut *m*		Tolerance on squareness of thread to face of nut	Eccentricity of hexagon	Thickness of thin nut *t*	
		max.	min.	max.	min.	max.	min.	max.	max.	max.	min.
M3	0·5	5·50	5·38	6·40	6·08	2·40	2·15	0·09	0·14	—	—
M4	0·7	7·00	6·85	8·10	7·74	3·20	2·90	0·11	0·18	—	—
M5	0·8	8·00	7·85	9·20	8·87	4·00	3·70	0·13	0·18	—	—
M6	1	10·00	9·78	11·50	11·05	5·00	4·70	0·17	0·18	—	—
M8	1·25	13·00	12·73	15·00	14·38	6·50	6·14	0·22	0·22	5·0	4·70
M10	1·5	17·00	16·73	19·60	18·90	8·00	7·64	0·29	0·22	6·0	5·70
M12	1·75	19·00	18·67	21·90	21·10	10·00	9·64	0·32	0·27	7·0	6·64
M14	2	22·00	21·67	25·10	24·49	11·00	10·57	0·37	0·27	8·0	7·64
M16	2	24·00	23·67	27·70	26·75	13·00	12·57	0·41	0·27	8·0	7·64
M18	2·5	27·00	26·67	31·20	30·14	15·00	14·57	0·46	0·27	9·0	8·64
M20	2·5	30·00	29·67	34·60	33·53	16·00	15·57	0·51	0·33	9·0	8·64
M22	2·5	32·00	31·61	36·90	35·72	18·00	17·57	0·54	0·33	10·0	9·64
M24	3	36·00	35·38	41·60	39·98	19·00	18·48	0·61	0·33	10·0	9·64
M27	3	41·00	40·38	47·30	45·63	22·00	21·48	0·70	0·33	12·0	11·57
M30	3·5	46·00	45·38	53·10	51·28	24·00	23·48	0·78	0·33	12·0	11·57
M33	3·5	50·00	49·38	57·70	55·80	26·00	25·48	0·85	0·39	14·0	13·57
M36	4	55·00	54·26	63·50	61·31	29·00	28·48	0·94	0·39	14·0	13·57
M39	4	60·00	59·26	69·30	66·95	31·00	30·38	1·03	0·39	16·0	15·57
M42	4·5	65·00	64·26	75·10	72·61	34·00	33·38	1·11	0·39	16·0	15·57
M45	4·5	70·00	69·26	80·80	78·25	36·00	35·38	1·20	0·39	18·0	17·57
M48	5	75·00	74·26	86·60	83·91	38·00	37·38	1·29	0·39	18·0	17·57

WASHERS FOR HEXAGON BOLTS AND NUTS METRIC SERIES

(from BS 4320)

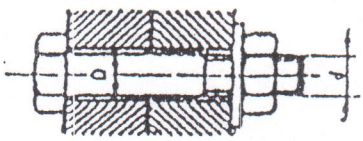


Dimensions in millimetres

Clearance hole d_1	Diameter of washer d_2 for width across flats			Thickness of washer	For thread diameters
	normal	small	large	S	d
mm	mm	mm	mm	mm	mm
1·7	4	—	—	0·3	1·6
2·2	5	—	—	0·3	2
2·7	6·5	—	—	0·5	2·5
3·2	7	—	—	0·5	3
4·3	9	—	—	0·8	4
5·3	10	—	—	1	5
6·4	12·5	—	—	1·6	6
7·4	14	—	—	1·6	7
8·4	17	15·5	21	1·6	8
10·5	21	18	24	2	10
13	24	21	28	2·5	12
15	28	24	30	2·5	14
17	30	28	34	3	16
19	34	30	37	3	18
21	37	34	39	3	20
23	39	37	44	3	22
25	44	39	50	4	24
28	50	44	56	4	27
31	56	50	60	4	30
34	60	56	66	5	33
37	66	60	72	5	36
40	72	66	77	6	39

CLEARANCE HOLES FOR METRIC I

(from BS 4186)

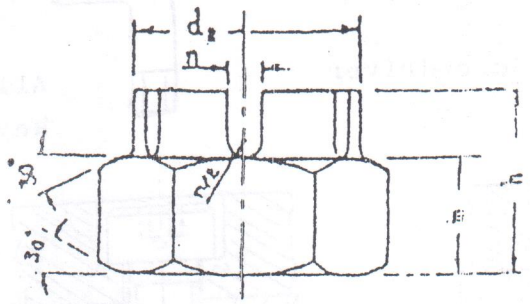


Thread diameter d	Clearance holes D
1·6	2
2	2·6
2·5	3·1
3	3·6
4	4·8
5	5·8
6	7
7	8
8	10
10	12
12	15
14	17
16	19
18	21
20	24
22	26
24	28
27	32
30	35
33	38
36	42
39	45

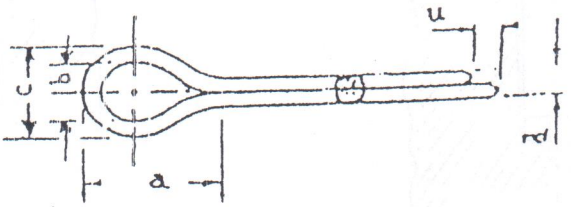
Castle nuts and split pins
(From German standards DIN 935)
All dimensions in mm

Size	d_1	d_2	s	e_{min}	h	m	n
M12	12.0	17.0	19.0	21.9	15.0	10.0	3.5
M14	14.0	19.0	22.0	25.4	16.0	11.0	3.5
M16	16.0	22.0	24.0	27.7	19.0	13.0	4.5
M18	18.0	25.0	27.0	31.2	21.0	15.0	4.5
M20	20.0	29.0	30.0	34.6	22.0	16.0	4.5
M22	22.0	30.0	32.0	36.9	26.0	18.0	5.5
M24	24.0	34.0	36.0	41.6	27.0	19.0	5.5
M27	27.0	38.0	41.0	47.3	30.0	22.0	5.5
M30	30.0	42.0	46.0	53.1	33.0	24.0	7.0
M33	33.0	46.0	50.0	57.7	35.0	26.0	7.0
M36	36.0	50.0	55.0	63.5	38.0	29.0	7.0
M39	39.0	55.0	60.0	69.3	40.0	31.0	7.0

Diam. of hole in screw	d	a	b	c	u
0.6	0.5	2.5	0.5	1.0	1.5
0.8	0.7	2.8	0.6	1.3	1.5
1.0	0.9	3.0	0.8	1.7	1.5
1.5	1.3	3.7	1.2	2.5	3.0
2.0	1.8	4.5	1.6	3.4	3.0
3.0	2.7	6.0	2.0	4.7	3.0
4.0	3.7	8.0	3.0	6.7	4.0
5.0	4.7	10.0	4.0	8.7	4.0
6.0	5.7	12.0	5.0	10.7	4.0
8.0	7.7	15.0	6.0	13.7	4.0
10.0	9.7	19.0	8.0	17.7	4.0
13.0	12.6	24.0	10.0	22.8	4.0
16.0	15.6	30.0	13.0	29.6	4.0
20.0	19.5	38.0	16.0	35.5	4.0



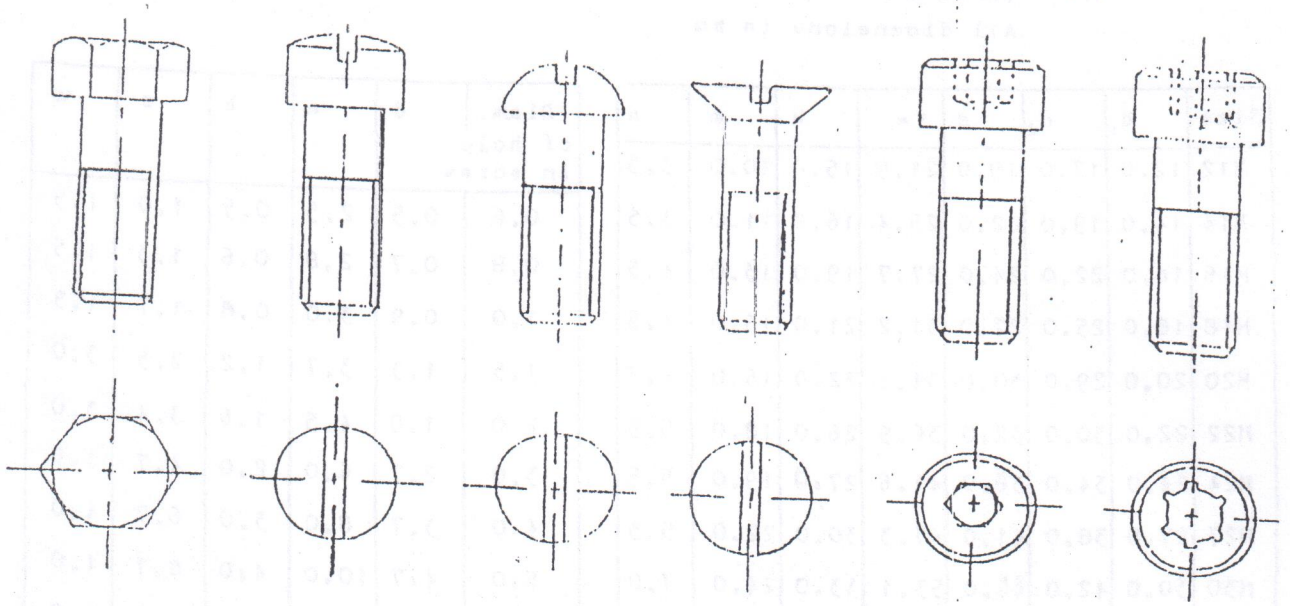
Castle nut



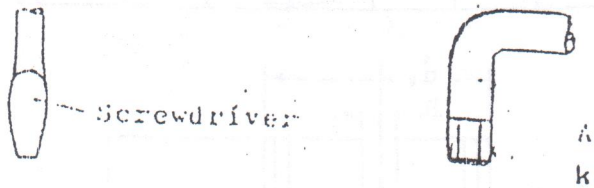
Split pin

Cap screws:

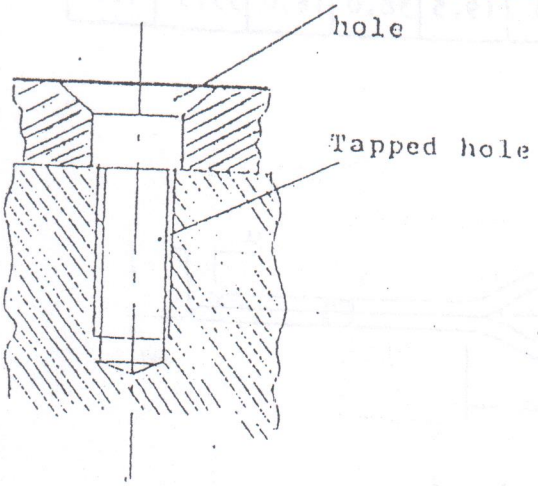
These are similar to small-size tap bolts except that a greater variety of shapes of heads are available as shown below.



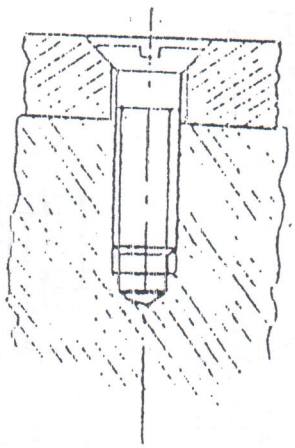
Hex. head | Filister head | button head | Flat head | Hex. socket head | Fluted socket head



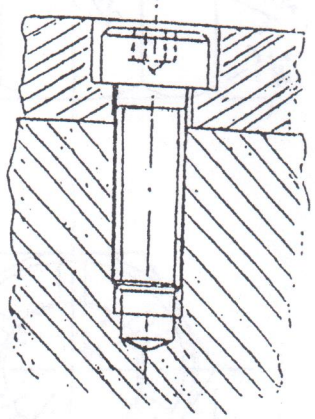
Screwdriver | Allen key



Countersunk hole | Tapped hole



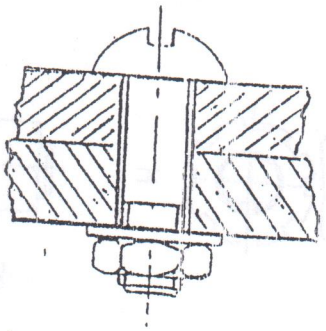
Cap screw

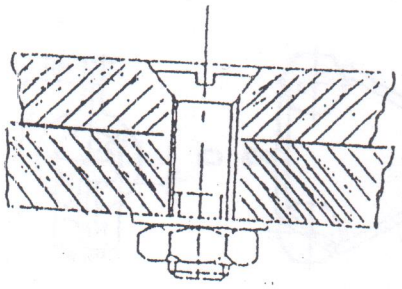


Cap screw

Machine screws:

These are cap screws slotted for a screwdriver and are generally used with a nut. They are used chiefly for small work having thin sections.

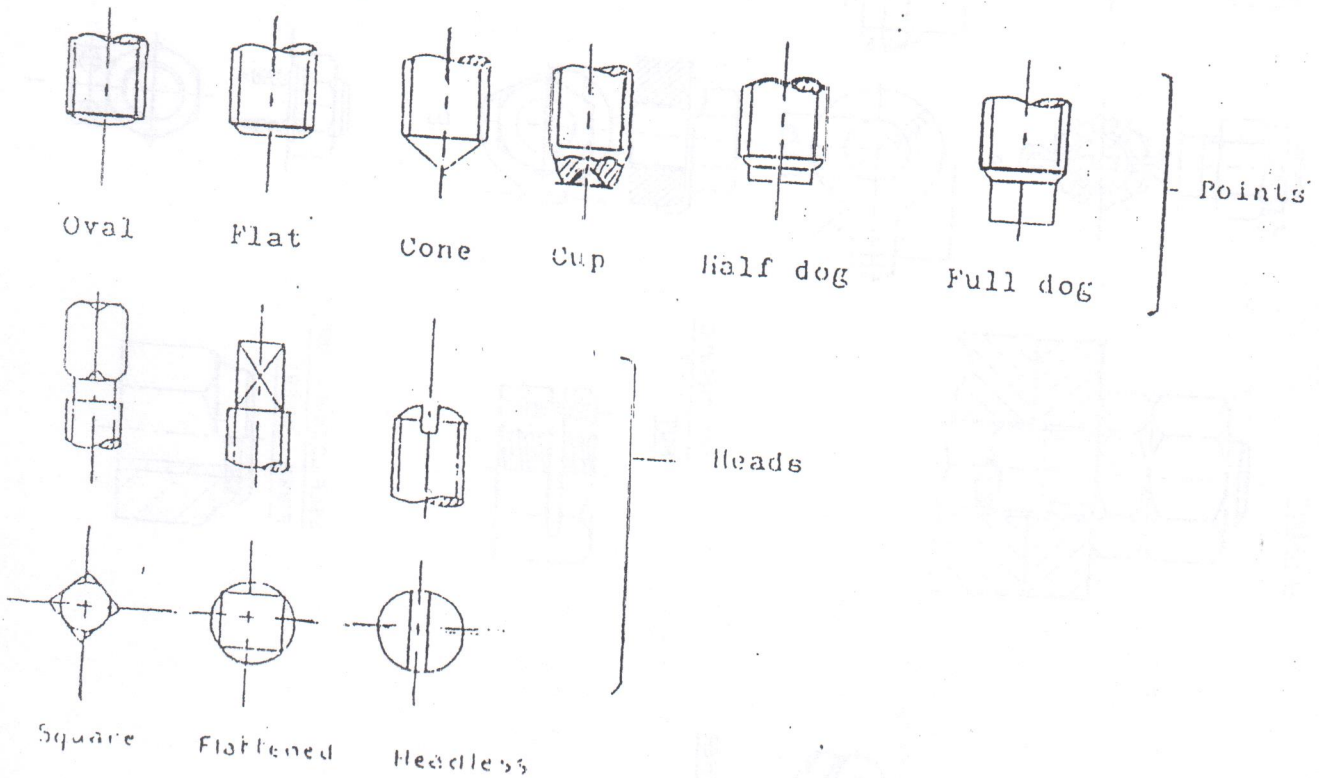




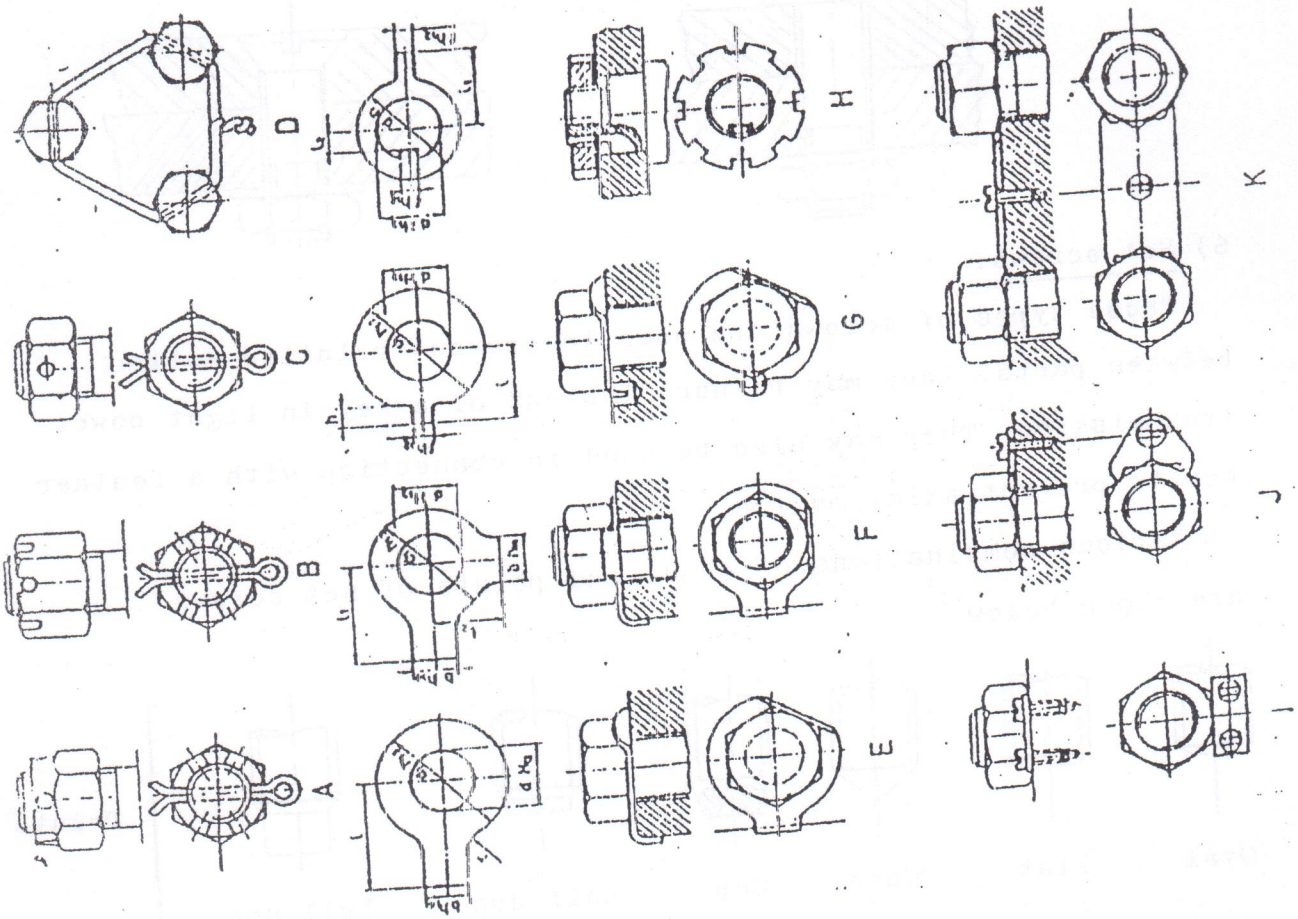
6) Set screws:

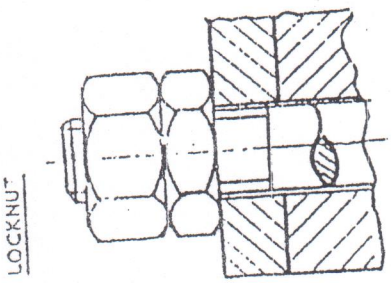
These types of screws are used to prevent relative motion between parts. They may be used instead of a key in light power transmission. They may also be used in connection with a feather key to prevent axial motion.

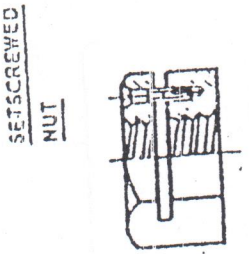
Various combinations of heads and points of set screws are shown below.

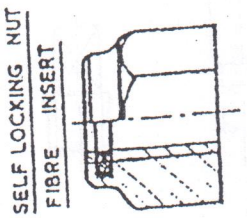


Locking Devices



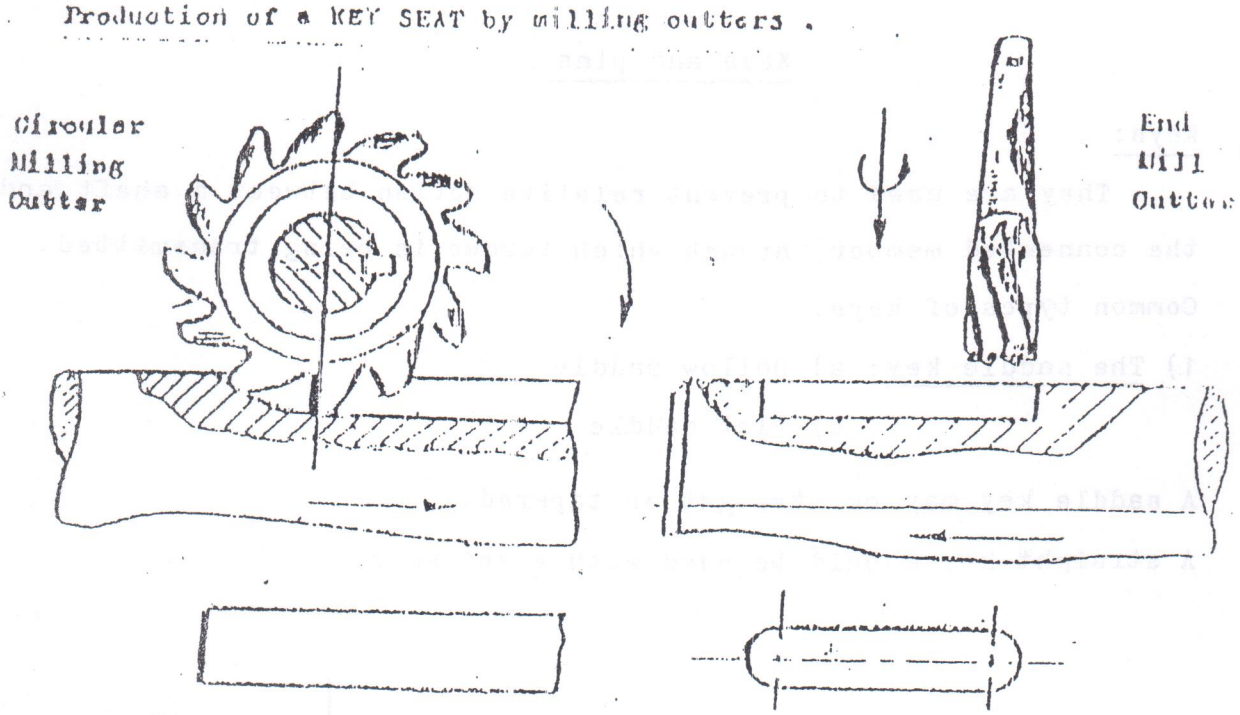


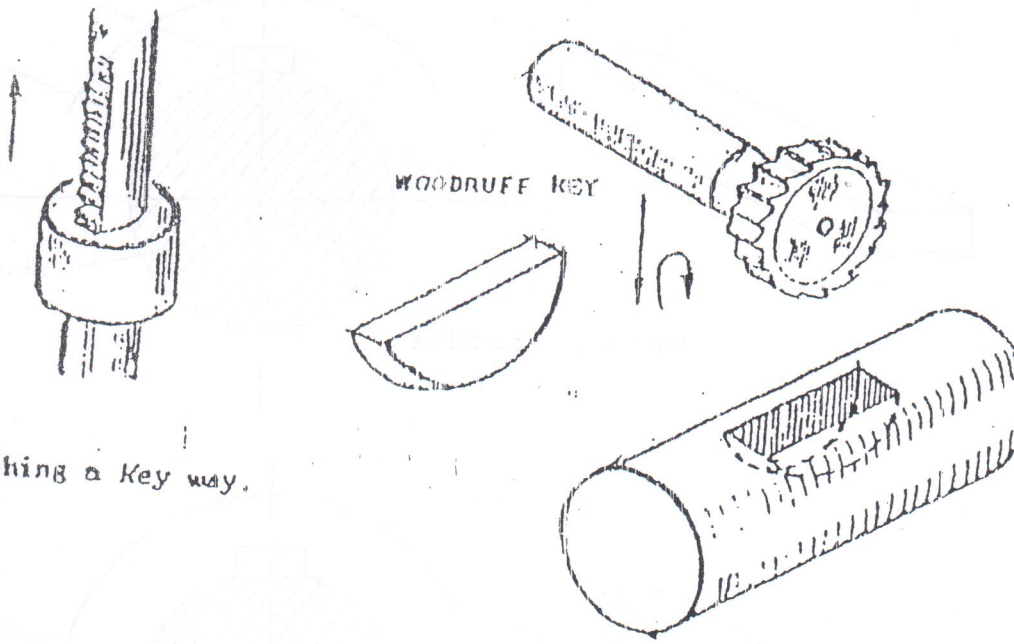




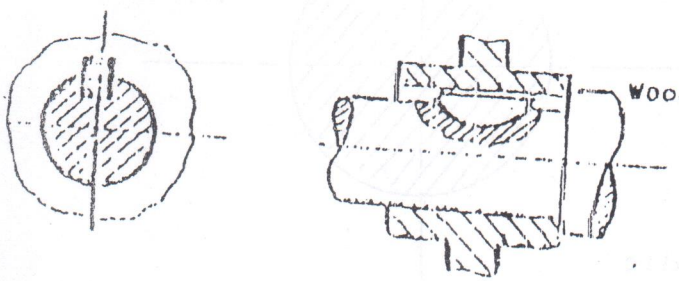
Keys & Pins

Production of a KEY SEAT by milling outters .





Broaching a Key way.



Woodruff key cutter and key seat.

Keys and pins

Keys:

They are used to prevent relative motion between a shaft and the connected member through which torque is being transmitted.

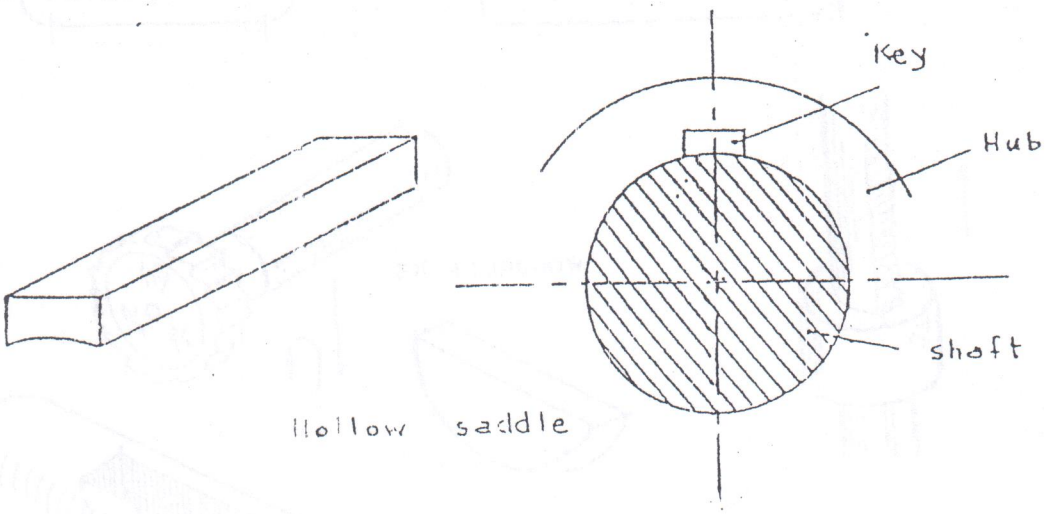
Common types of keys:

1) The saddle key: a) Hollow saddle

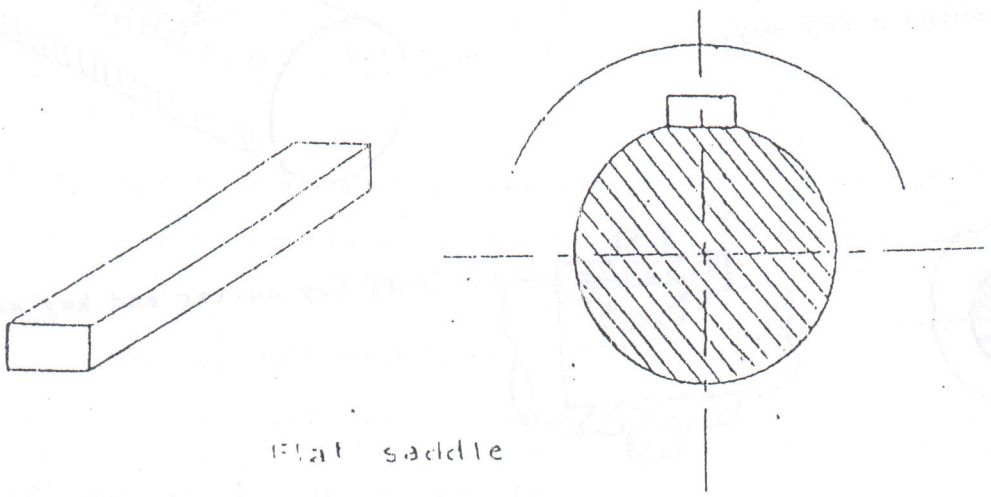
b) Flat saddle

A saddle key may be straight or tapered.

A straight key should be used with a set screw.



Hollow saddle

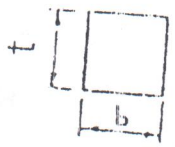


Flat saddle

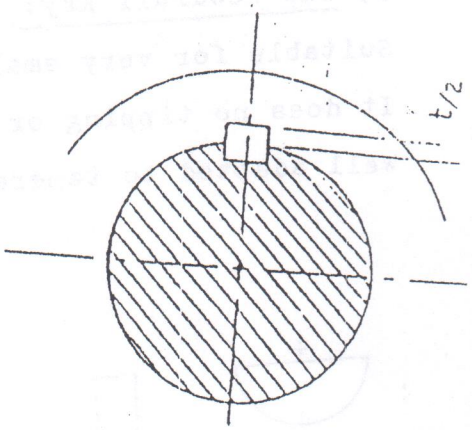
2) The square key:

Is common in general industrial machinary.

May be tapered or straight.

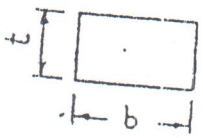


b = t

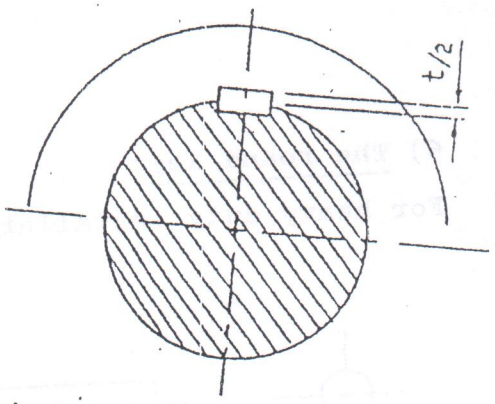


3) The flat key:

May be tapered or straight.

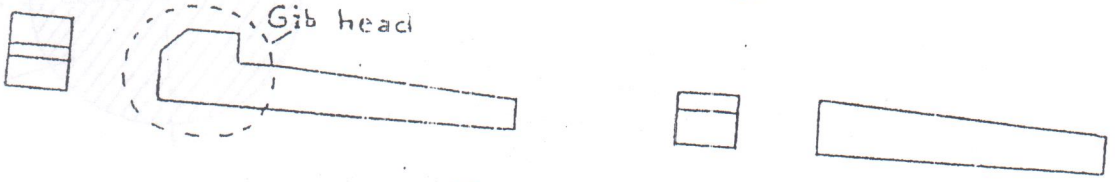


b > t



For both square and flat keys if tapered the height is tapered by 1:96

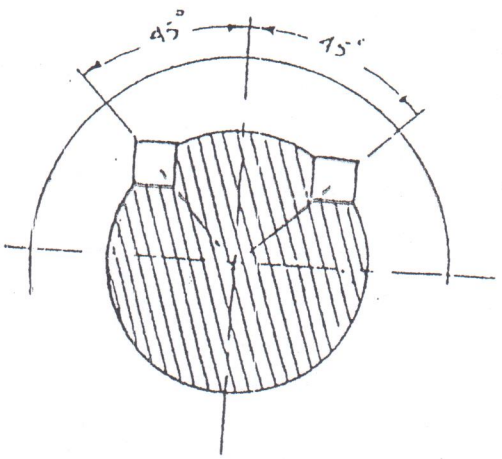
They may have gib heads to facilitate removal.



Taper key

4) The Kennedy key:

For heavy duty installations.

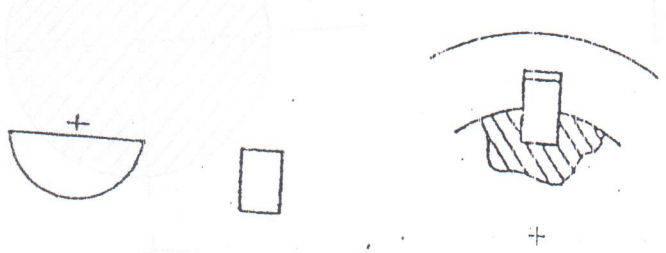


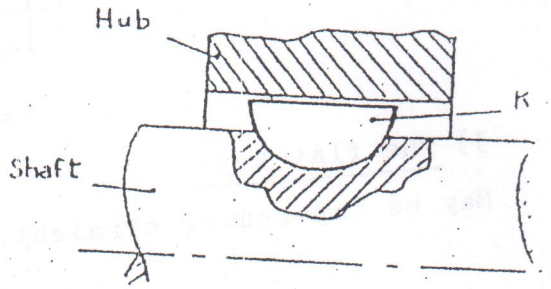
5) The Woodruff key:

Suitable for very small torques to avoid troublesome fitting.

It does no tipping or rolling.

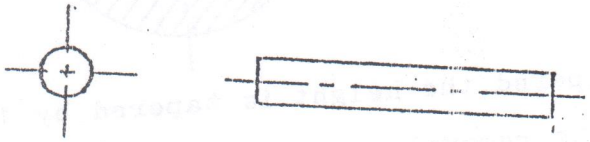
Well adapted to tapered shafts.

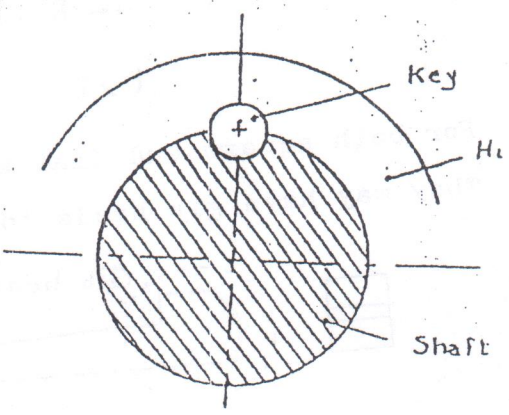




6) The round key:

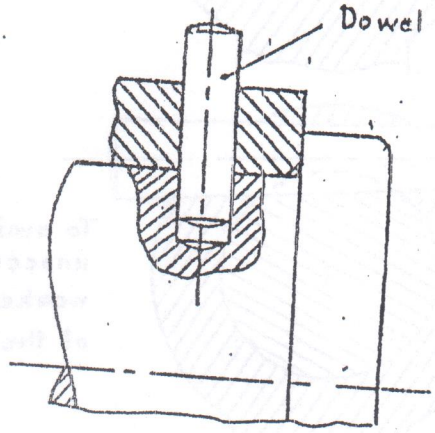
For heavy duty installations.

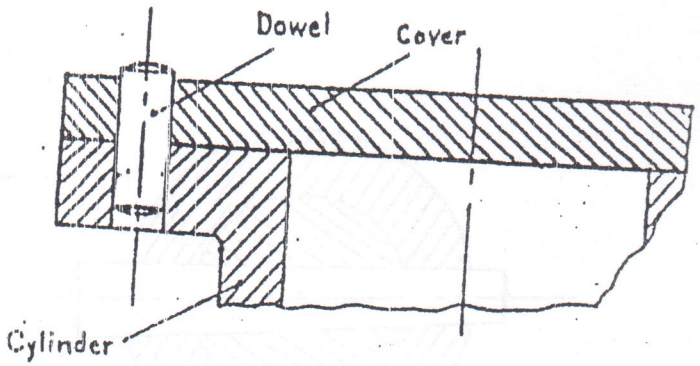


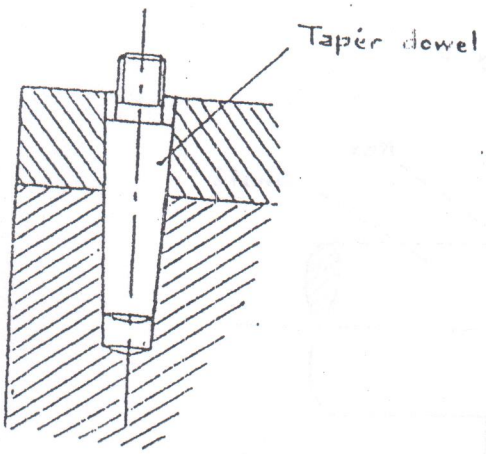


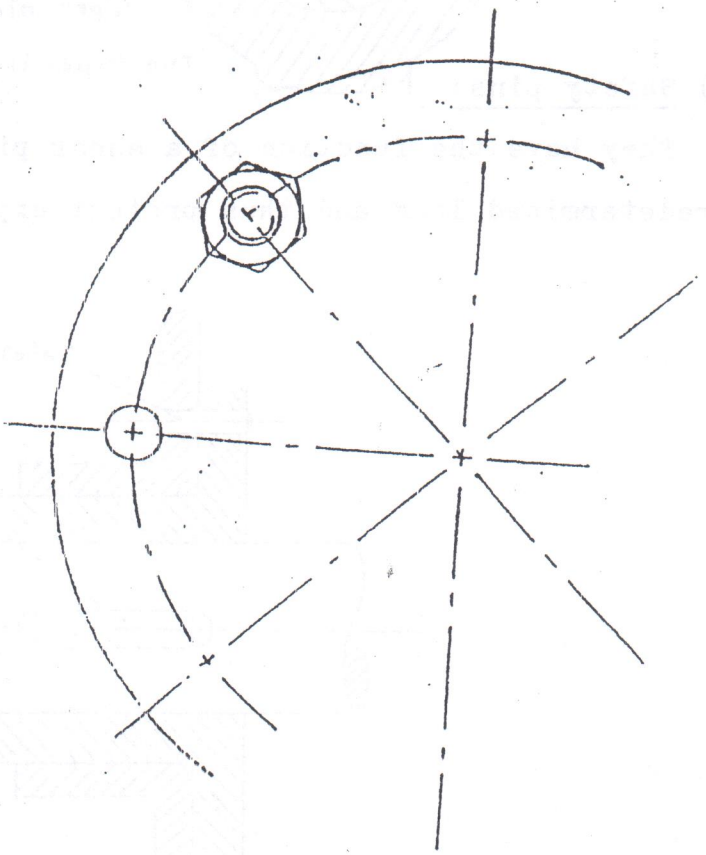
The function of pins may be classified as follows:

1) Locating pins (Dowel pins or Dowels for short):
   They fix the relative position of two parts.
   Negligible forces acting on them.





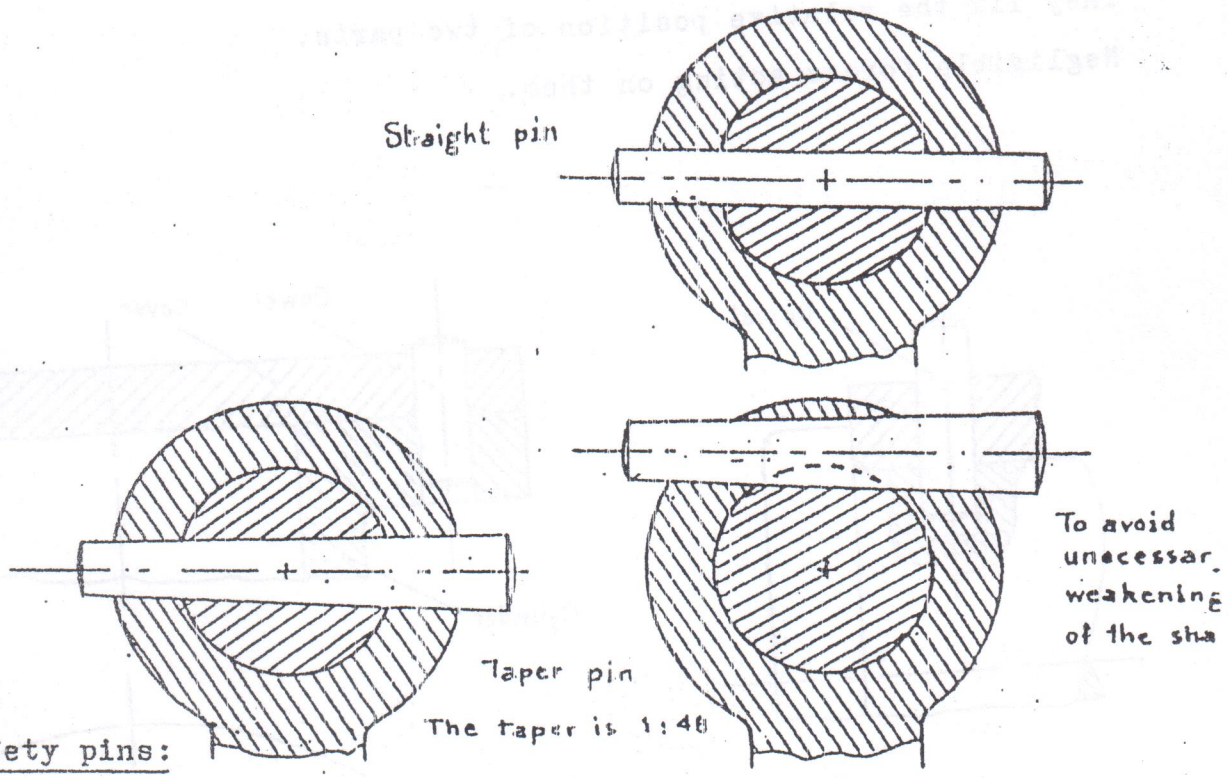




2) Shear pins:

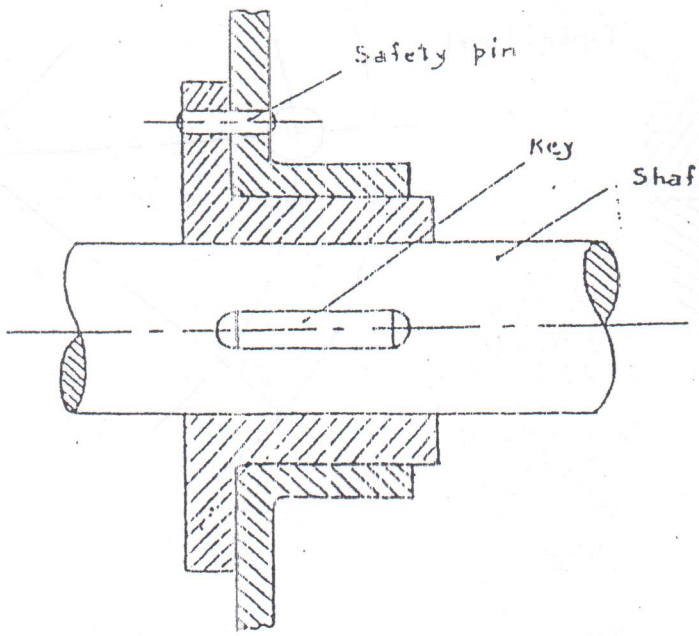
They transmit service loads.

They may be tapered or straight.

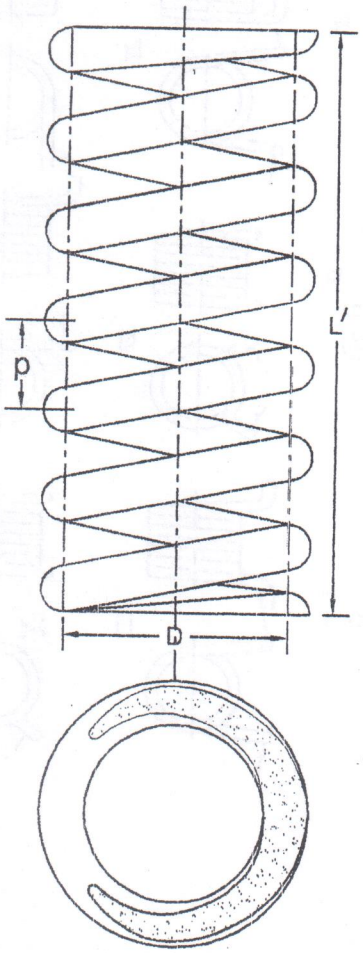


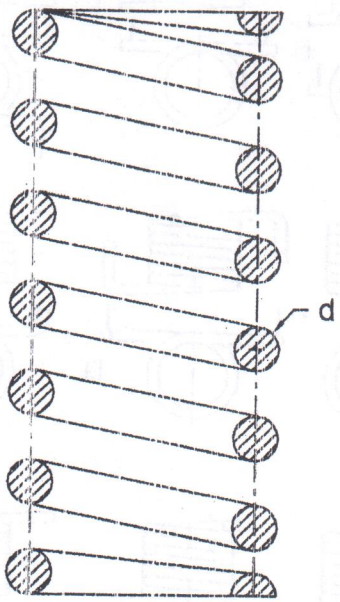
3) Safety pins:

They have the function of a shear pin but are designed to fail at a predetermined load and thus protect expensive parts from damage.

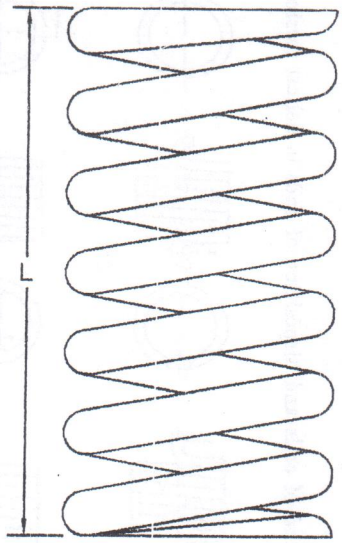


HELICAL COMPRESSION SPRING





Sectioned Spring



Compressed spring

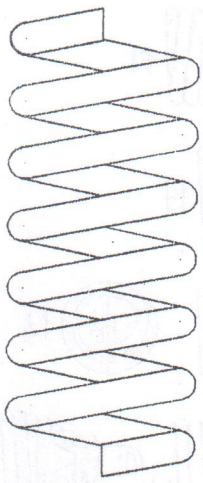
d = Wire diarneter

D = Coil Diarneter

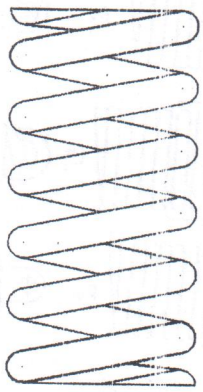
L' = Free length

L = Compressed length

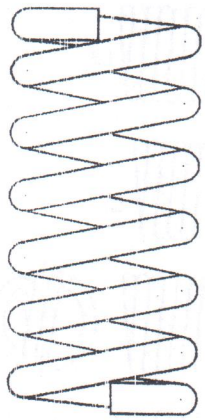
p = pitch



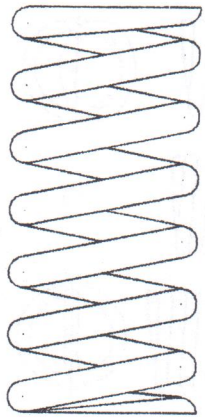
Plain Ends



Plain and Ground ends



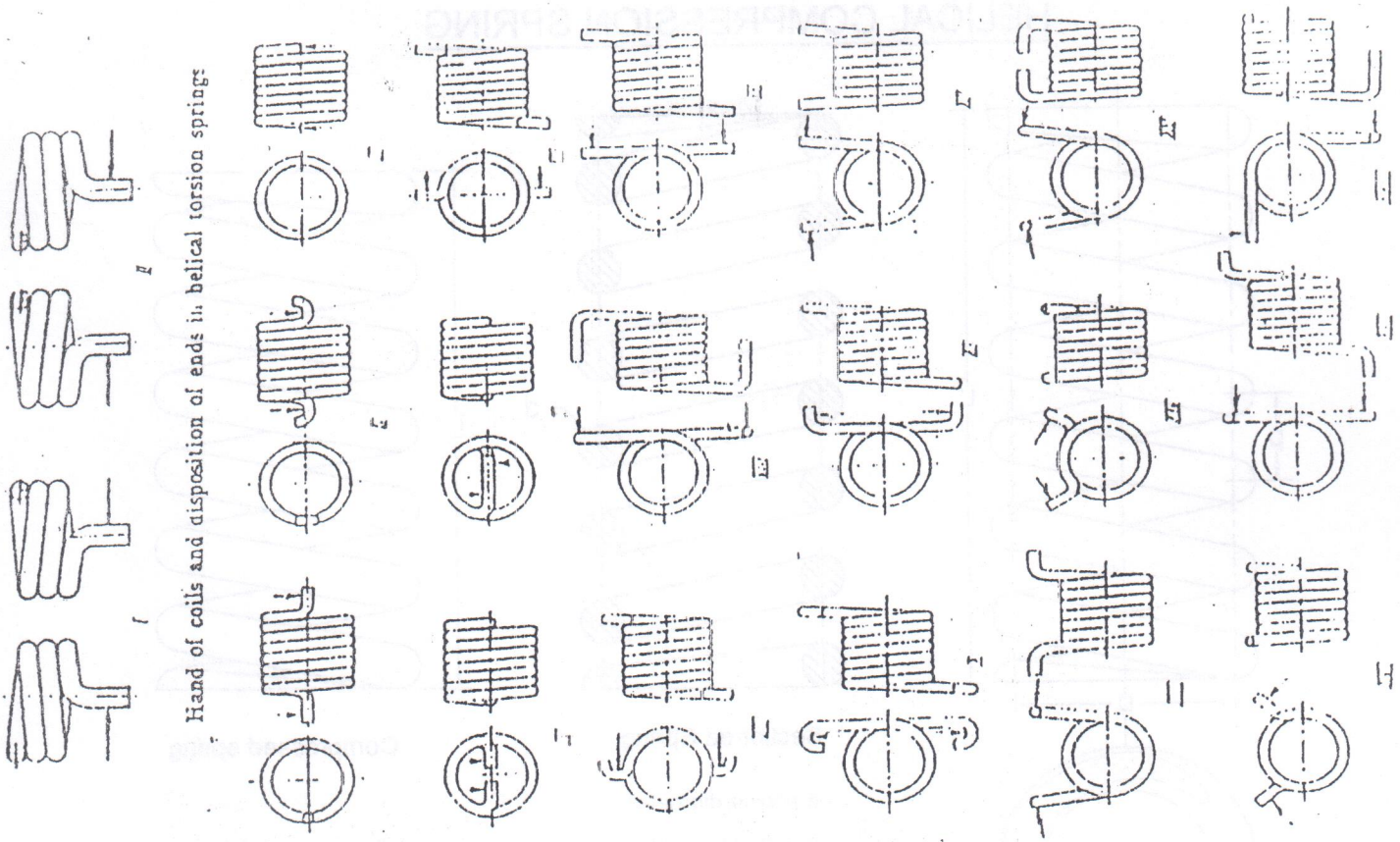
Squared ends

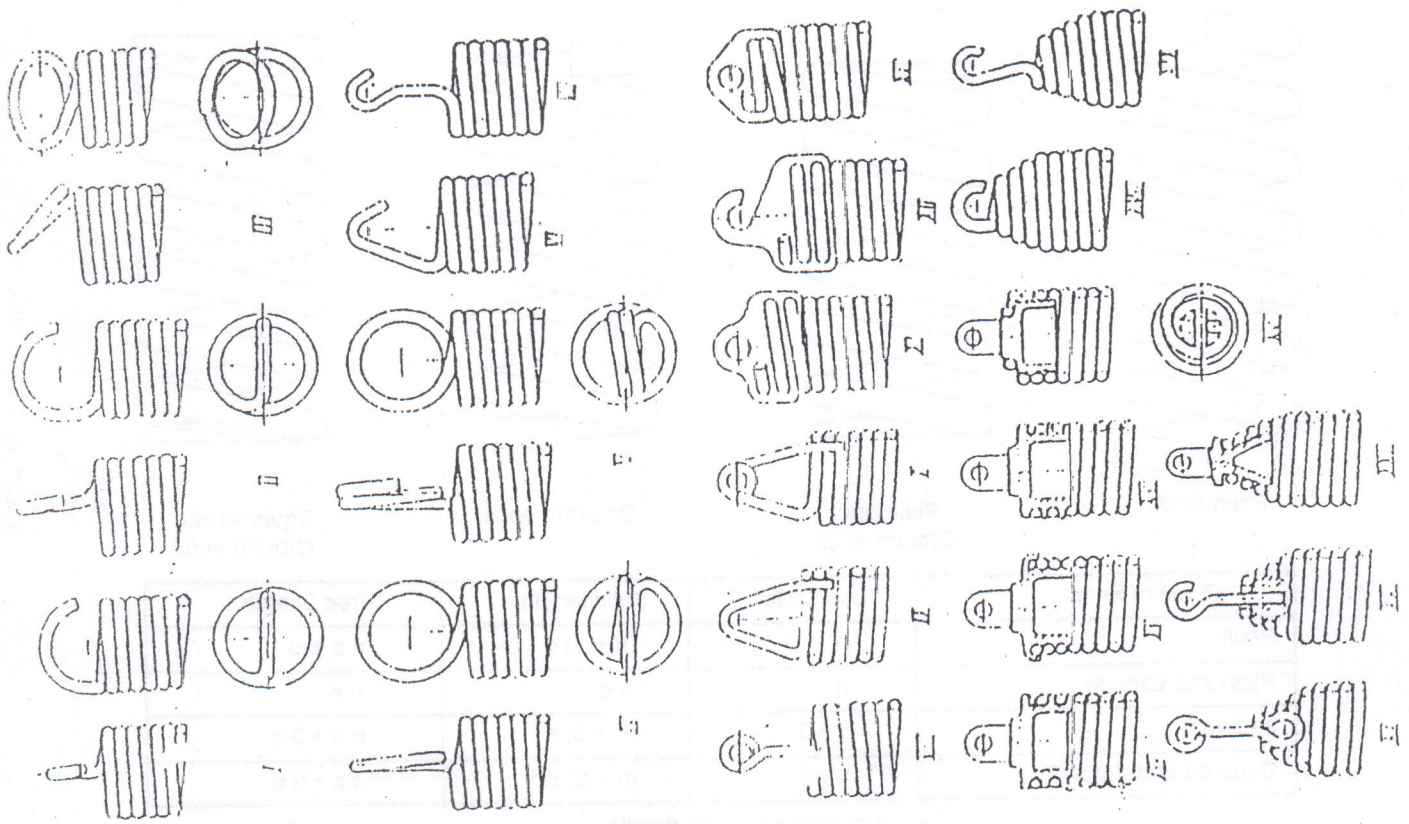


Squared and Ground ends

Type of Ends	Total Coils	Solid length	Free Length
Plain	n	(n + 1) d	n p + d
Plain and Ground	n	n d	n p
squared	n + 2	(n + 3) d	n p + 3 d
Squared and ground	n + 2	(n + 2) d	n p + 2 d

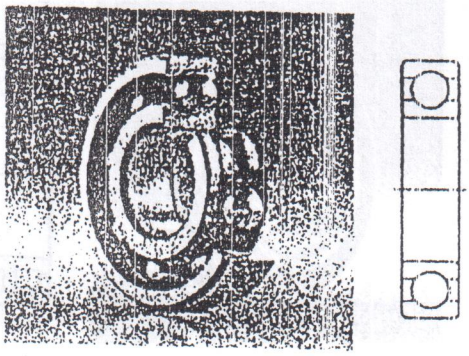
n = number of active coils


Hand of coils and disposition of ends in helical torsion springs

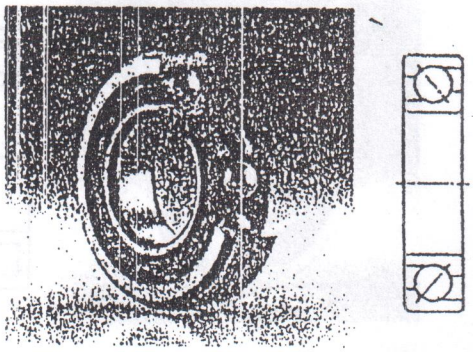


Antifriction Bearings

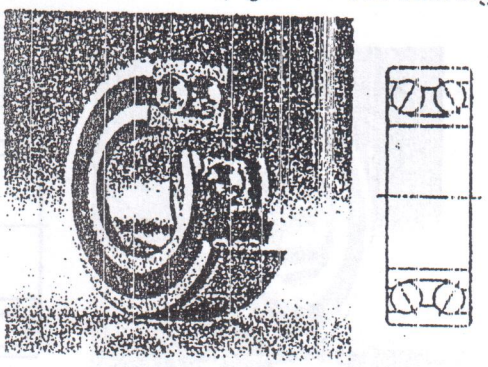
Ball Bearings



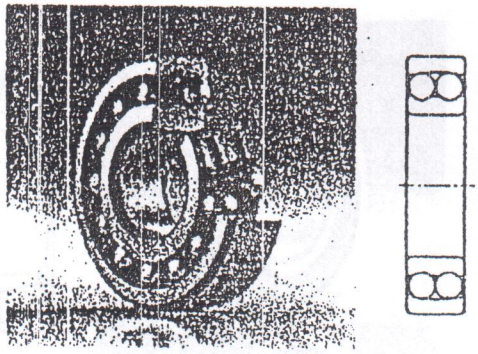
Single row Deep groove ball bearings



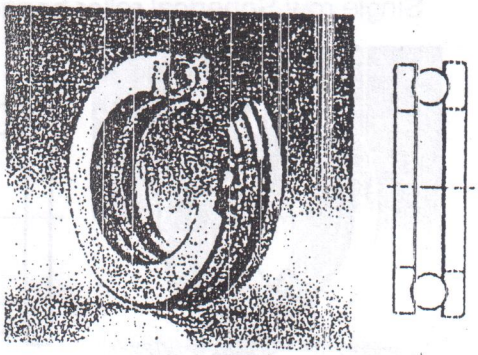
Angular contact D.G. ball bearings



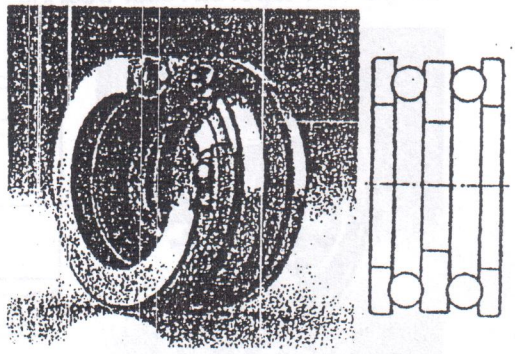
Double row ang. contact ball bearings



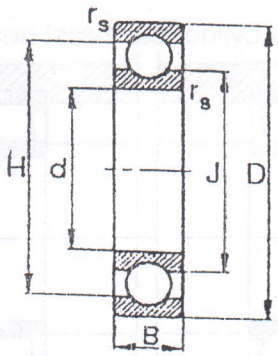
Self Aligned D. G. ball bearings

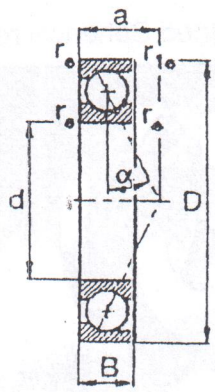


Deep groove Thrust ball bearings



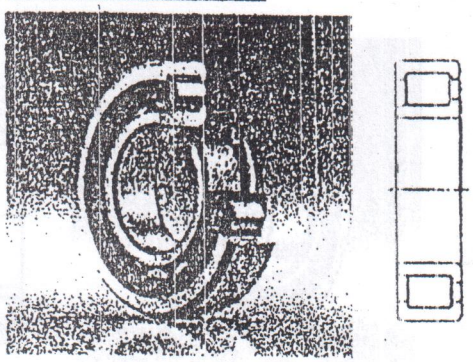
Double Row Thrust ball bearings



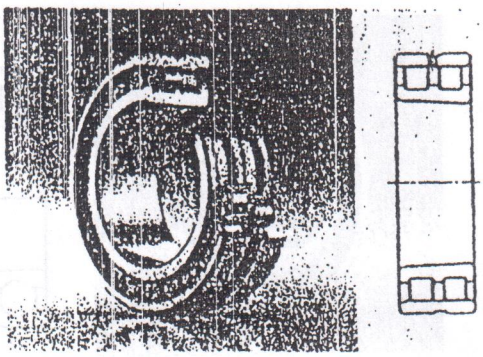


Antifriction Bearings (2)

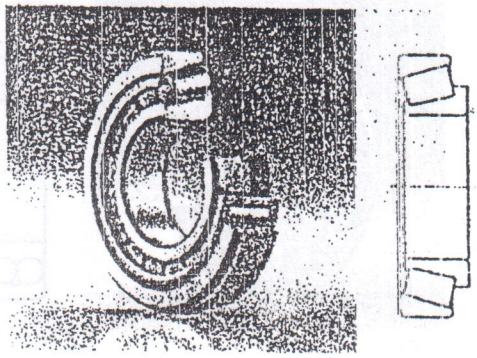
Roller Bearings



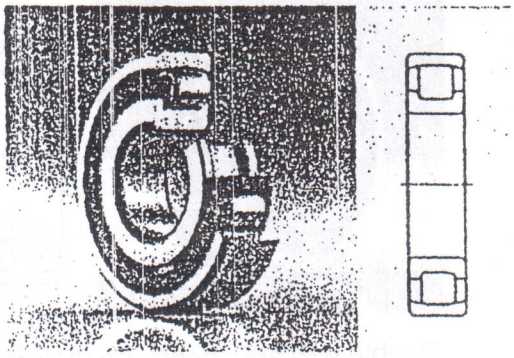
Single row cylindrical roller bearing



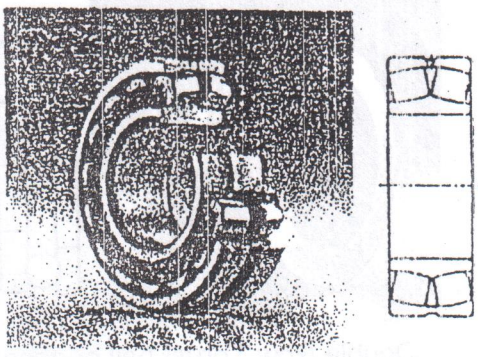
Double row cylindrical roller bearing



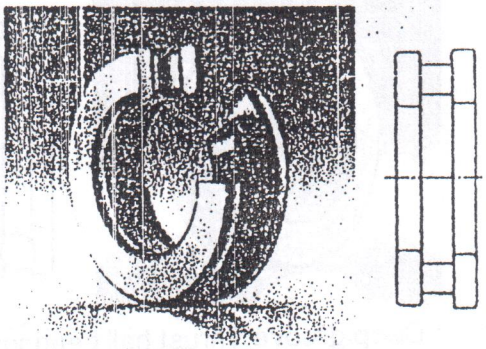
Single row tapered roller bearing



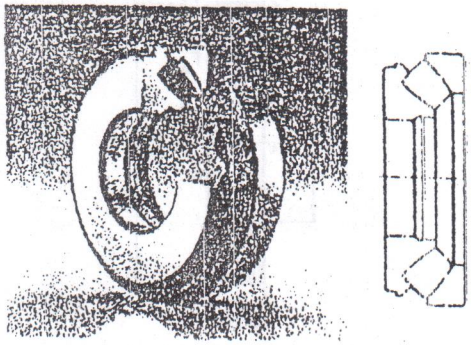
Single row Spherical roller bearing



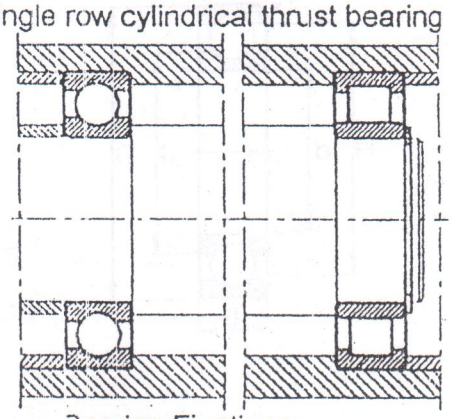
Self aligned Spherical roller bearing



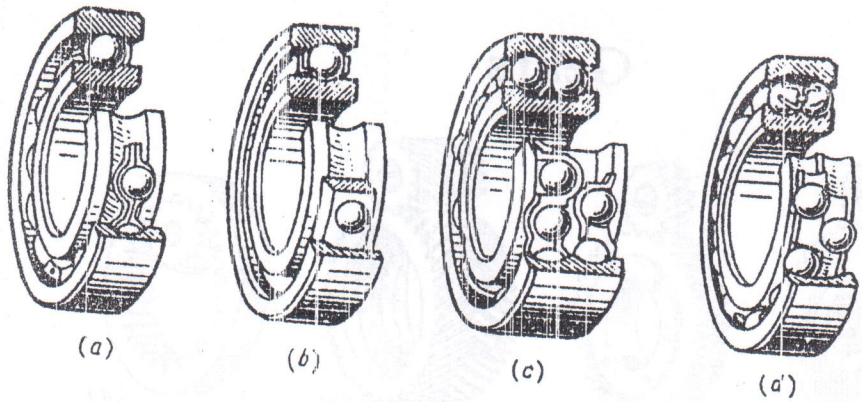
Single row cylindrical thrust bearing

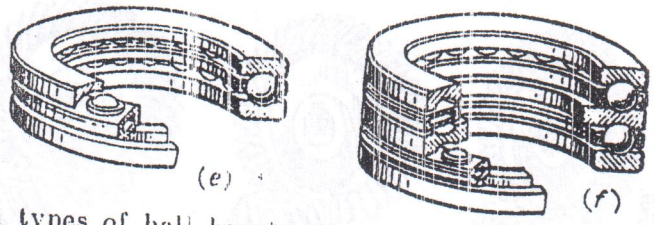


Tapered thrust roller bearings

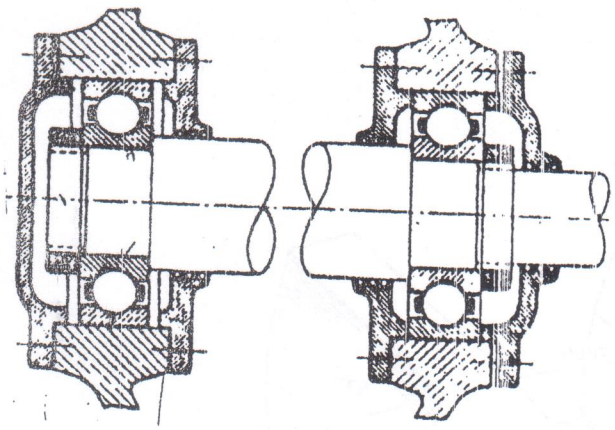


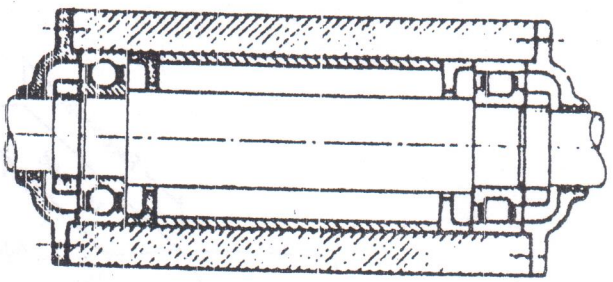
Bearing Fixations

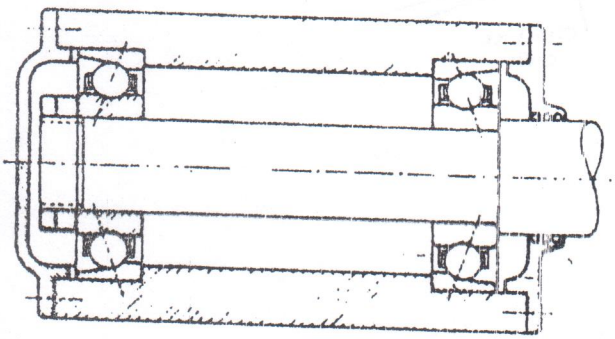


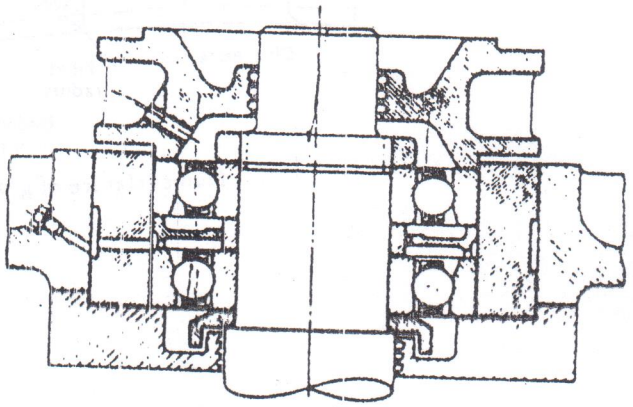


Main types of ball bearings



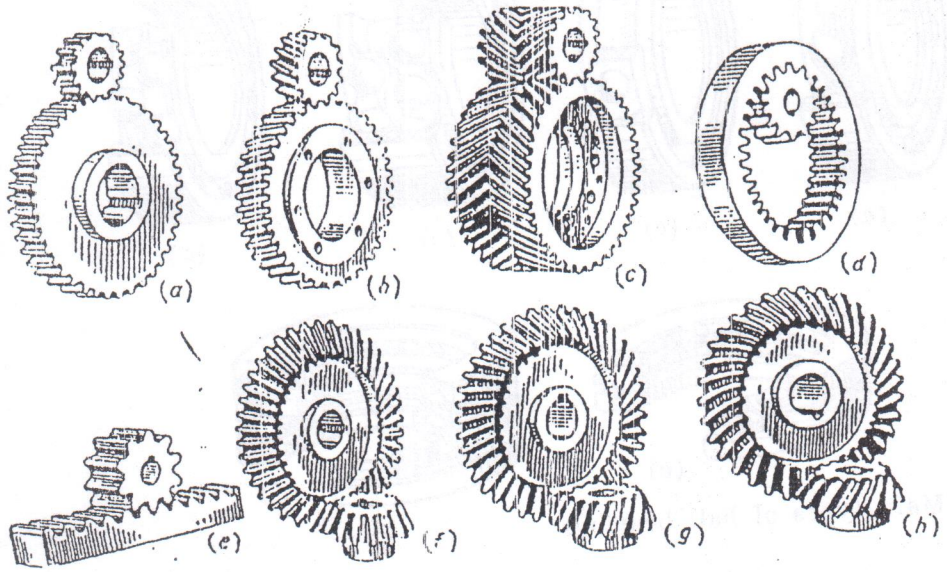




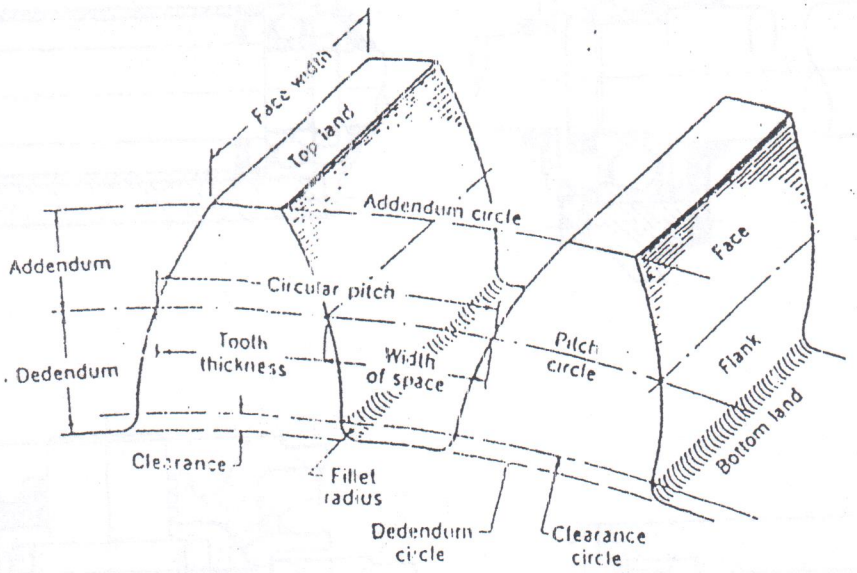


Matched angular contact unit with baffle spacer

Gears

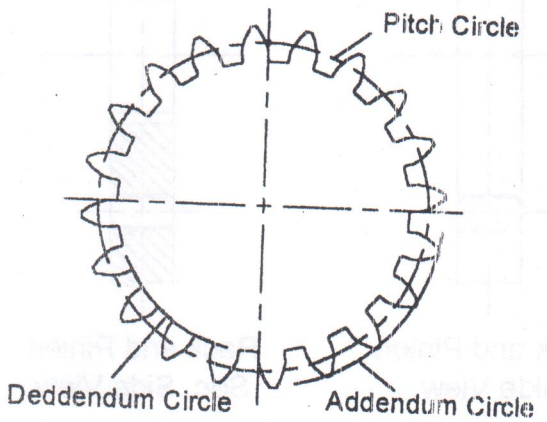


Principal types of toothed gears

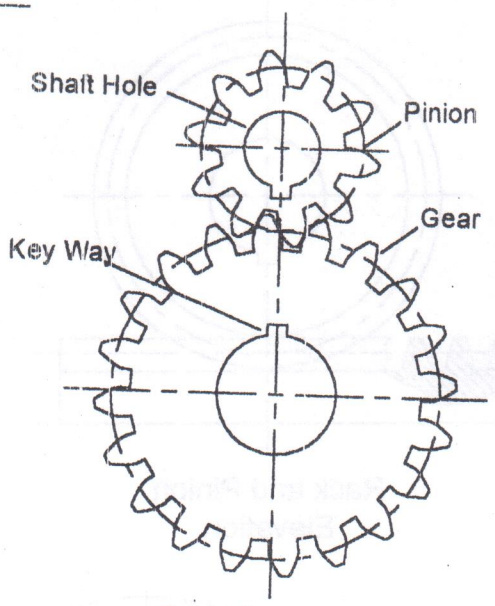


Nomenclature of gear teeth.

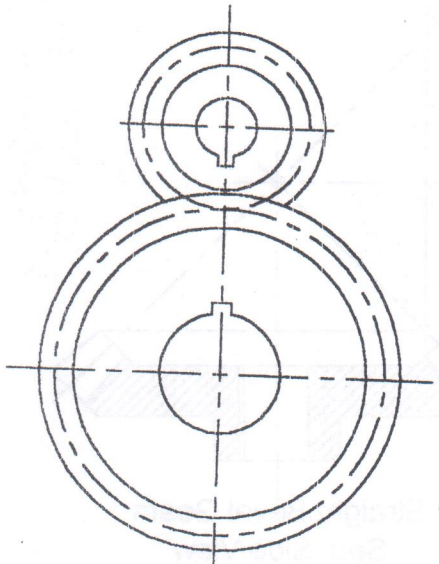
GEARS



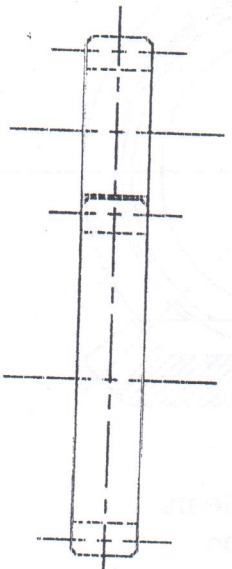
Spur Gear Geometry



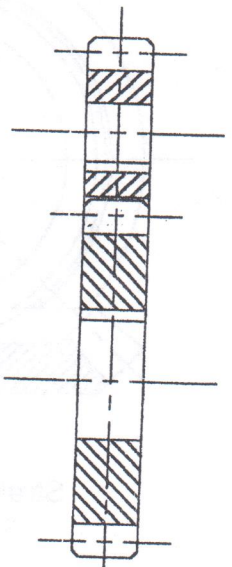
Spur Gear Pair



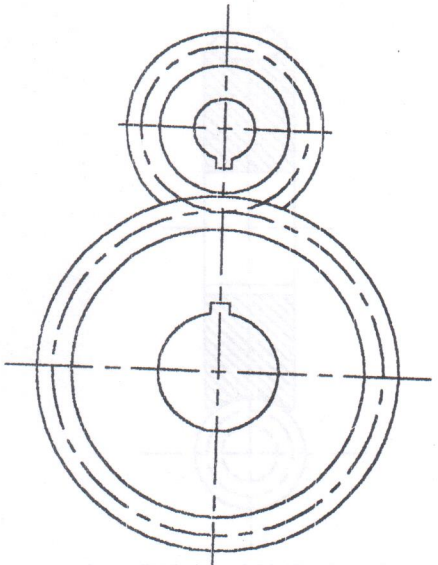
Spur Gear Elevation



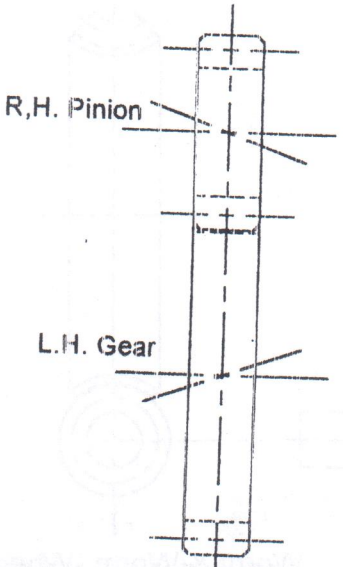
Spur Gear Side View



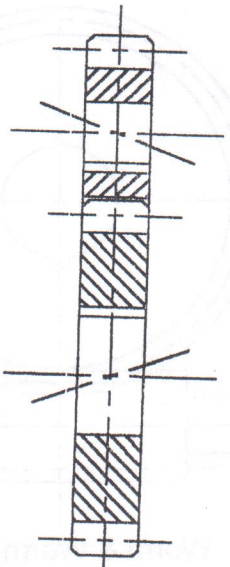
Spur Gear Sec. Side View



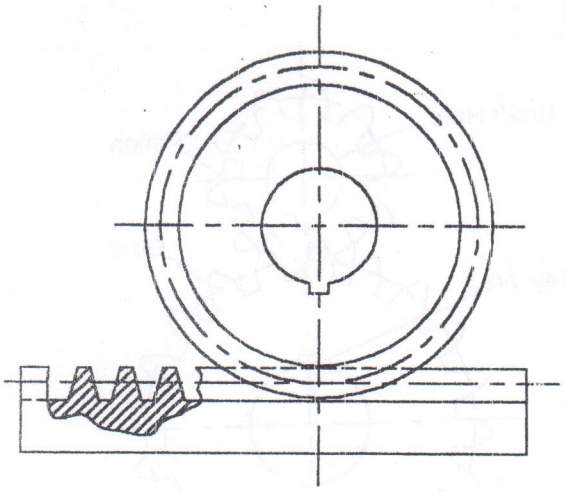
Helical Gear Elevation



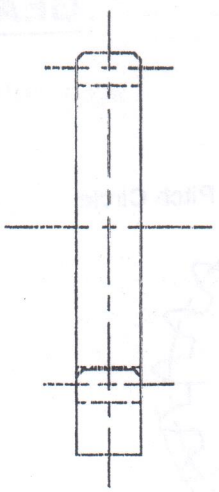
Helical Gear Side View



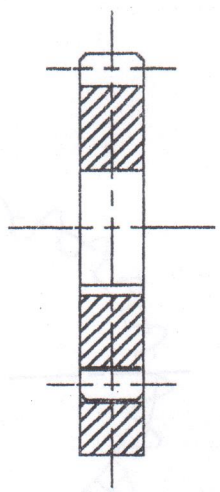
Helical Gear Sec. Side View



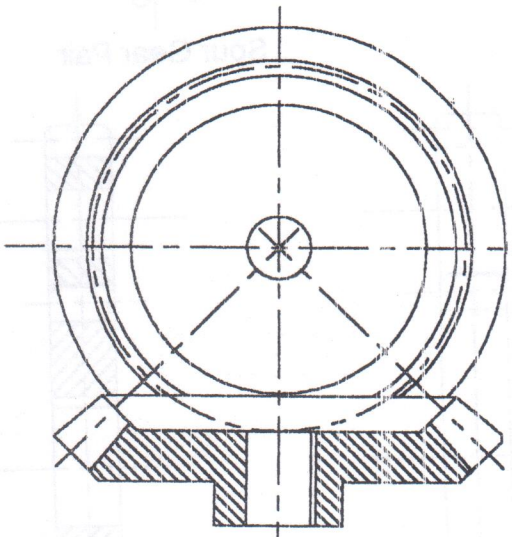
Rack and Pinion
Elevation



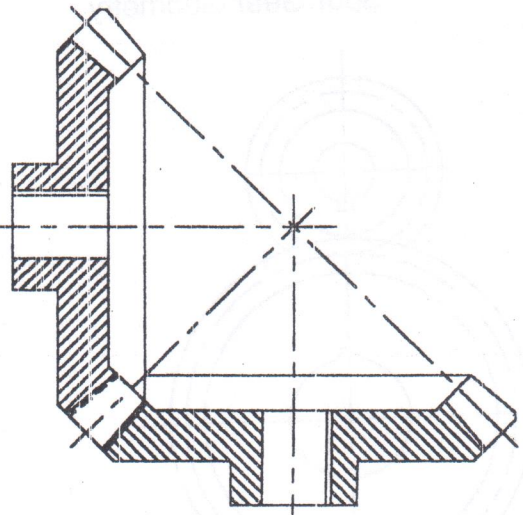
Rack and Pinion
Side View



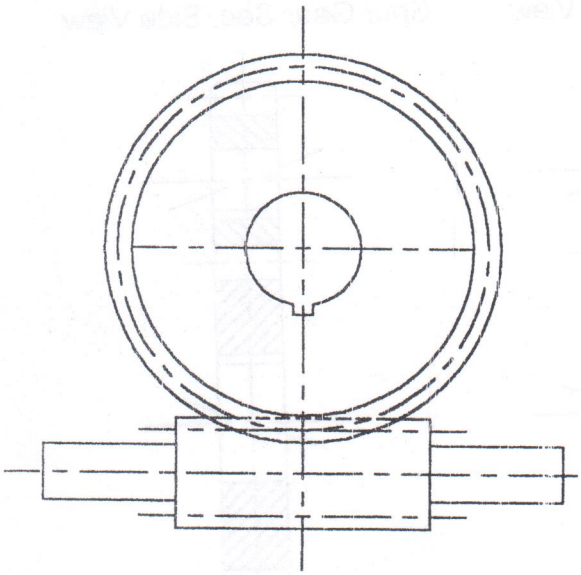
Rack and Pinion
Sec. Side View



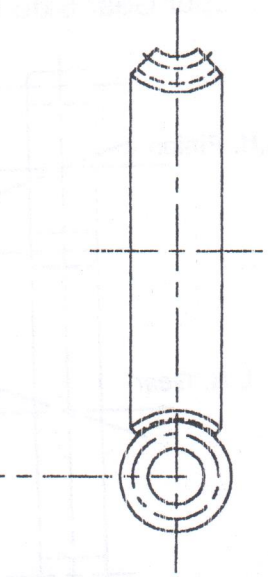
Straight Bevel Gears
Sec. Elevation



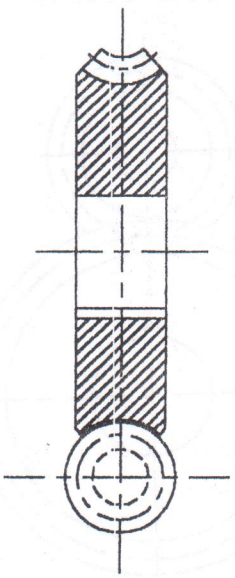
Straight Bevel Gears
Sec. Side View



Worm & Worm-Wheel
Elevation



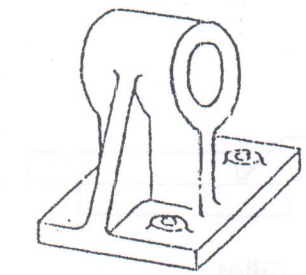
Worm & Worm -Wheel
Side View



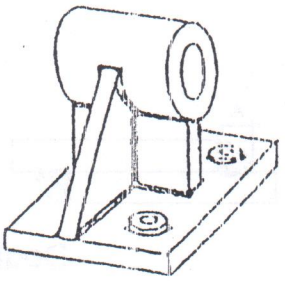
Worm & Worm-Wheel
Sec. Side View

Welded Joints

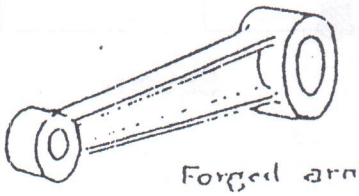
1- Fabrication in which welding is used as an alternative for casting or forging:



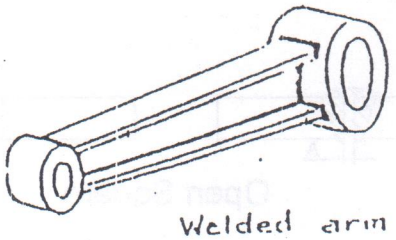
Casted bracket



Welded bracket

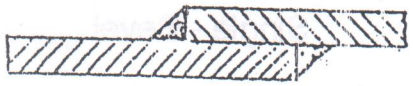


Forged arm

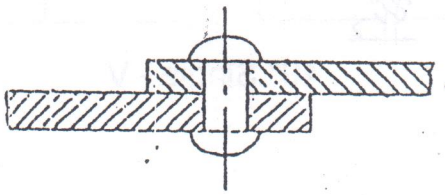


Welded arm

2- Fabrication in which welding in substituted for riveting.



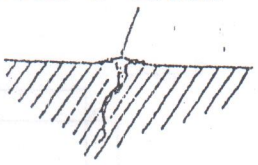
Lap welded joint



Lap riveted joint

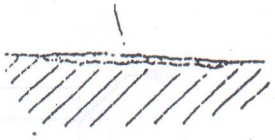
3- Welding is used as a repair medium.

To fill a crack



To fill a gap

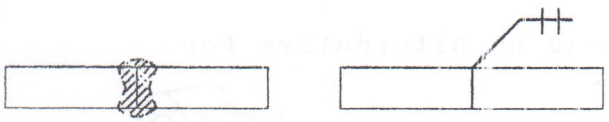
To repair a worn surface



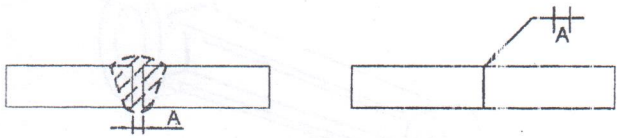
To weld a broken member

WELD SYMBOLS

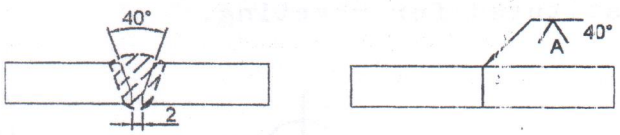
Butt - Welding



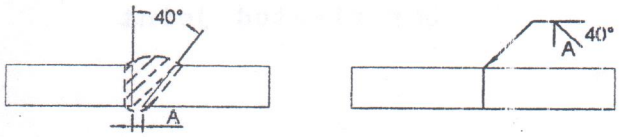
Square



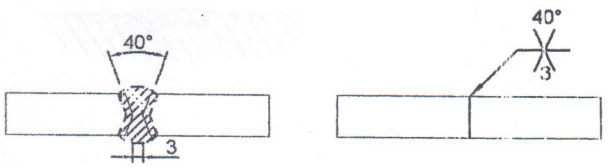
Open Square



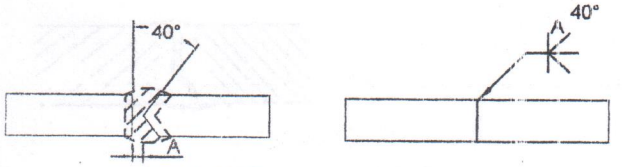
40° Single - V



40° Single - Bevel

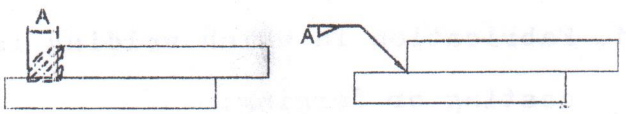


40° double - V

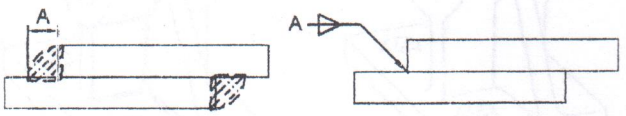


40° Double - Bevel

Fillet -Welding



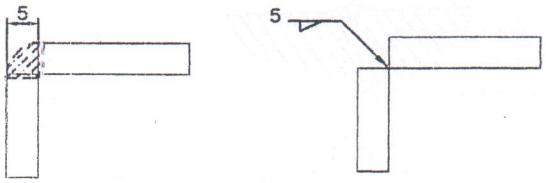
Single - Fillet



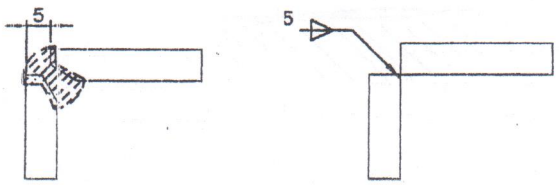
Double - Fillet

Single - Bevel

Double - Bevel



Single - Fillet



Double - Fillet

Fits and Tolerances

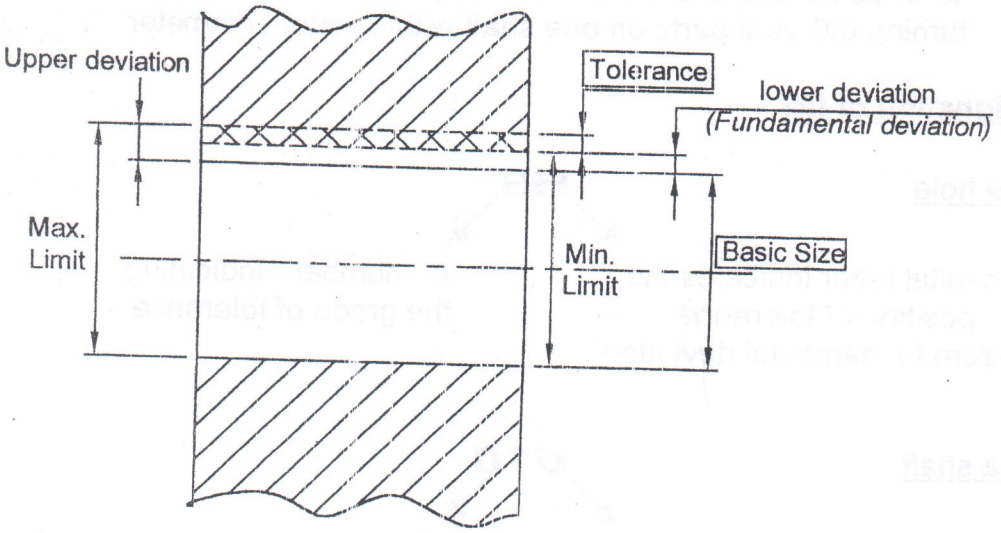
In the ISO system there are 27 positions provided for 18 grades of tolerances on both shaft and holes. This gives wide range of tolerance zone positions varying from above to below the basic size for both shaft and holes.

a, b, c, cd, d, e, ef, f, fg, g, h, j, k, m, n, p, r, s, t, u, v, x, y, z, za, zb, zc

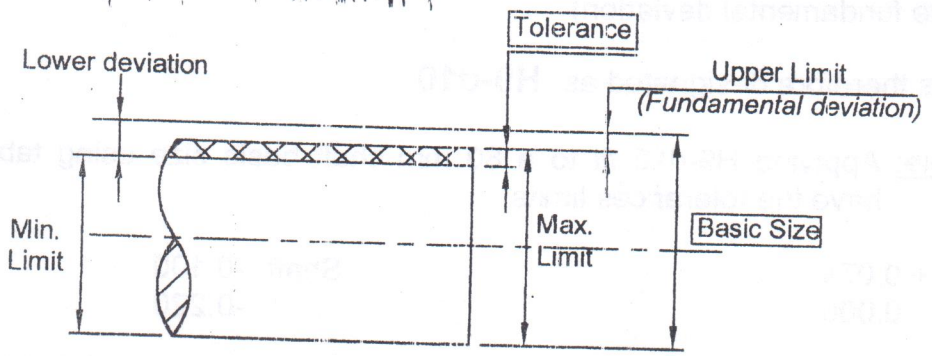
- Lower case letters are designated for shaft tolerance and capital letters for holes
- The "H" hole is the only one which has the basic size at the lower limit.
- The "h" shaft is the only one which has the basic size at the upper limit.

These two fundamental deviations (zero for both "h" shaft and "H" hole) enable a selection of fits to be made on either shaft or hole basis.

Hole Tolerance



ShaftTolerance



Upper deviation = **d** max - **d** basic **Lower deviation** = **d** min. - **d** basic

Tolerance = **d** max. - **d** min.

The hole basis system

Fits are obtained by regarding the hole dimension as standard with zero fundamental deviation "H" and varying the fundamental deviation of the shaft to suit. The 18 grades of tolerances is applied to alter the size of tolerance zones when required.

The shaft basis system

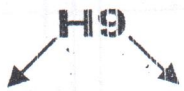
In this case the fundamental deviation of the shaft is zero "h" and fits are obtained by varying the fundamental deviation of the hole as well as applying the 18 grades of tolerances.

Note: ★ It is important to note that the hole base system is most commonly used because it is easier to produce standard holes by drilling or reaming and than turning the shaft to suit the fit desired where it is easier to get accurate measurements.

★ In some cases the shaft basis system is required as in case when turning different parts on one shaft with constant diameter.

Designation of fits

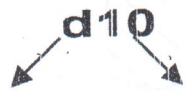
For a hole



A capital letter indicates the position of tolerance (H→zero fundamental deviation)

A number indicating the grade of tolerance

For a shaft



A lower case letter indicates the position of tolerance (d → -ve fundamental deviation)

A number indicating the grade of tolerance

the fit is therefore designated as **H9-d10**

Example: Applying H9-d10 fit to a 80 mm shaft basic size using tables we have the tolerances limits:

Hole $^{+0.074}_{0.000}$

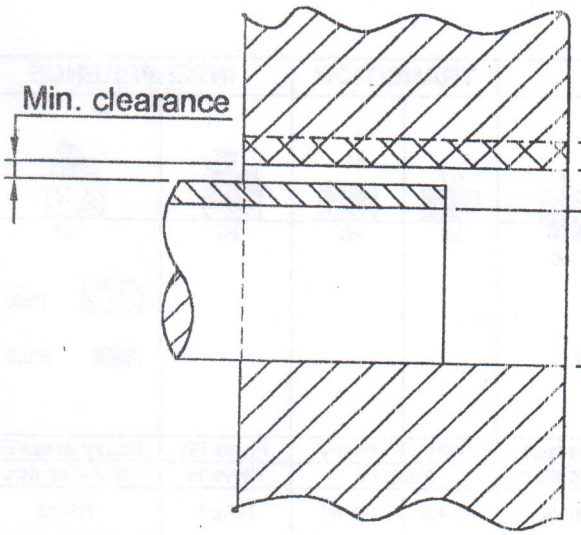
Shaft $^{-0.100}_{-0.220}$

d hole max. = 80.074 mm
d hole min. = 80.000 mm

d shaft max. = 79.900 mm
d shaft min. = 79.780 mm

Hole Basis System

Comparison between the three classes of Fits



Clearance Fit

$d_{shaft} < d_{hole}$

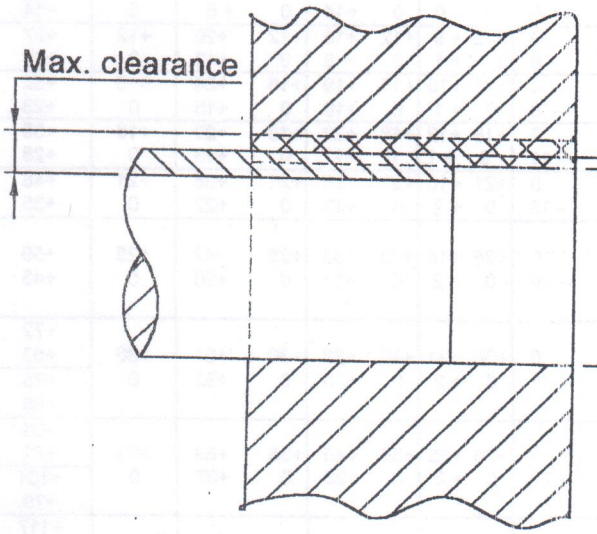
Positive allowance

Min. clearance = $d_{hole\ min.} - d_{shaft\ max.}$

Max. clearance = $d_{shaft\ max.} - d_{hole\ min.}$

hole shaft

relative motion exists



Transition Fit

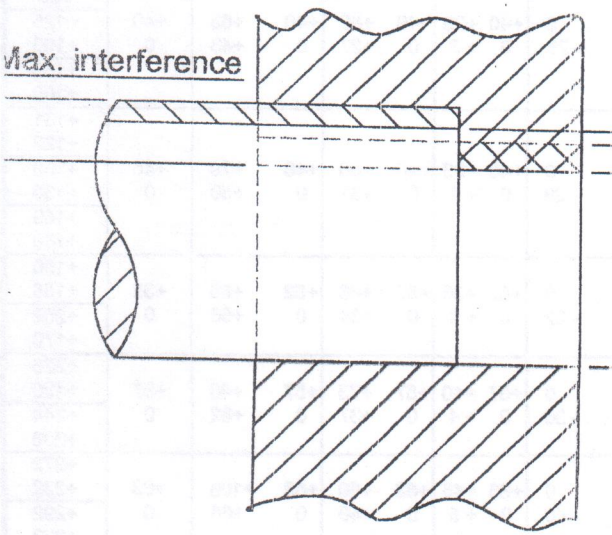
$d_{shaft\ max.} > d_{hole\ min.}$

$d_{shaft\ min.} < d_{hole\ max.}$

Max. clearance = $d_{hole\ max.} - d_{shaft\ min.}$

Max. interference = $d_{shaft\ max.} - d_{hole\ min.}$

Relative motion possible when clearence exists



Interference Fit

$d_{shaft\ min.} > d_{hole\ max.}$

Negative allowance

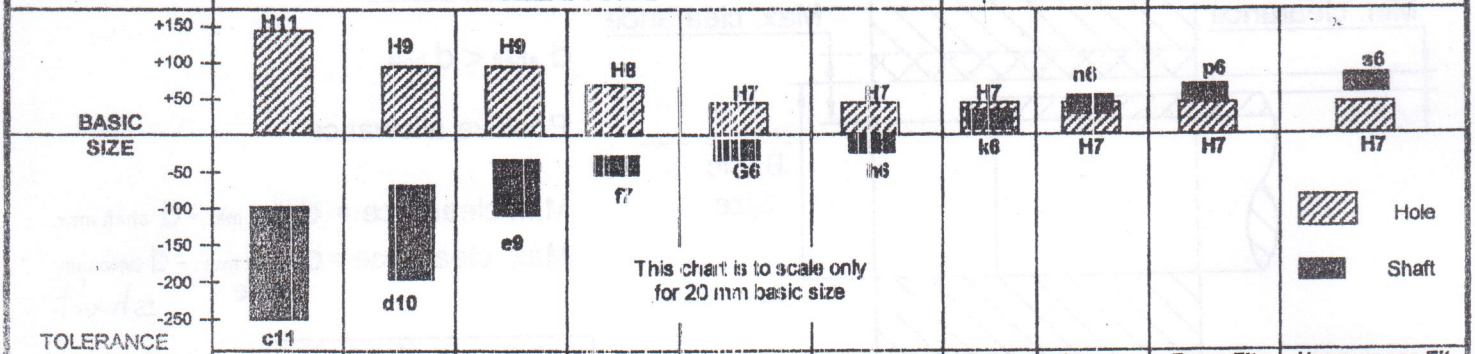
Min. Interference = $d_{shaft\ min.} - d_{hole\ max.}$

Max. Interference = $d_{shaft\ min.} - d_{hole\ max.}$

max min

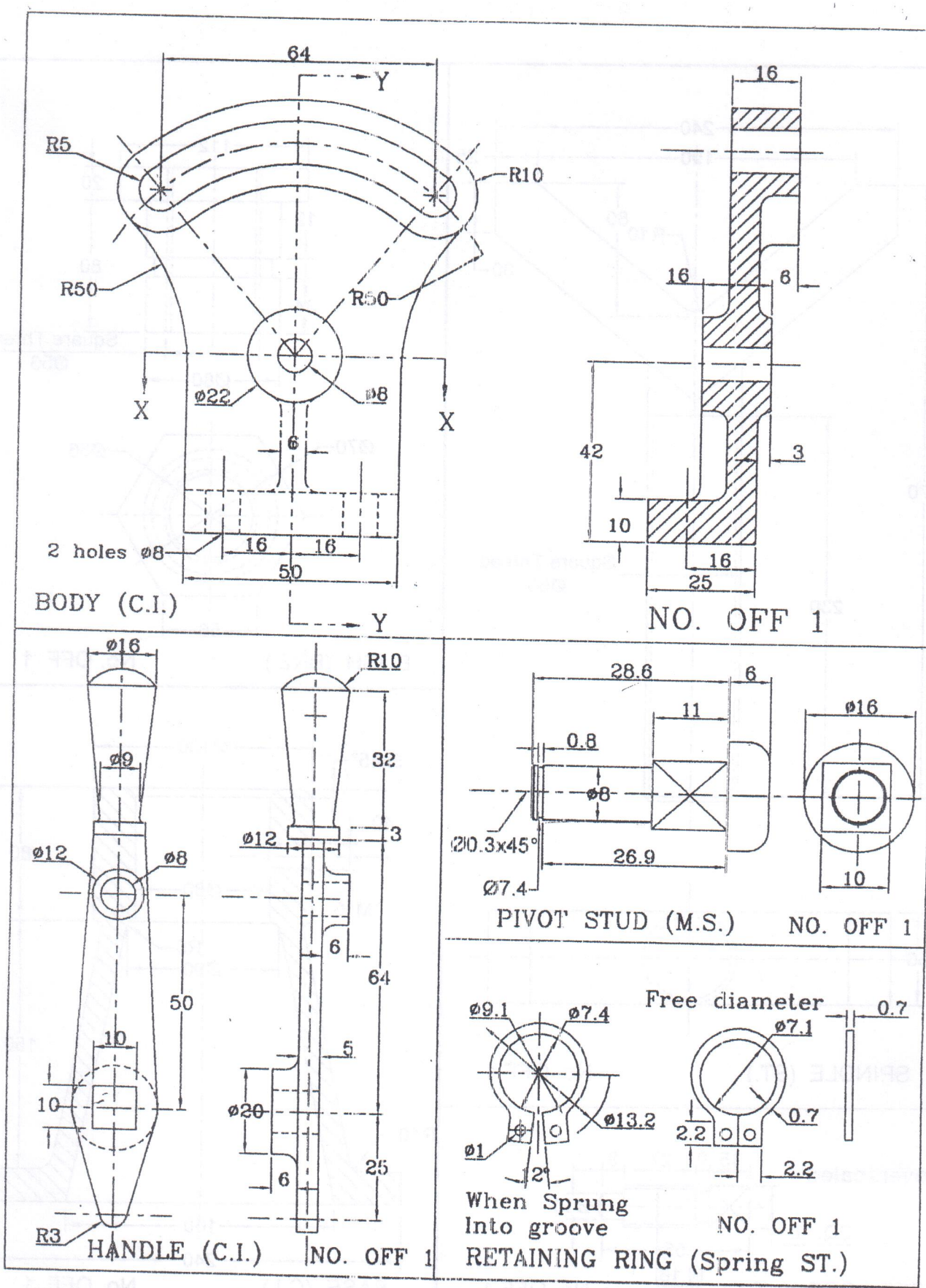
relative motion impossible

SELECTION OF FITS – HOLE BASIS SYSTEM



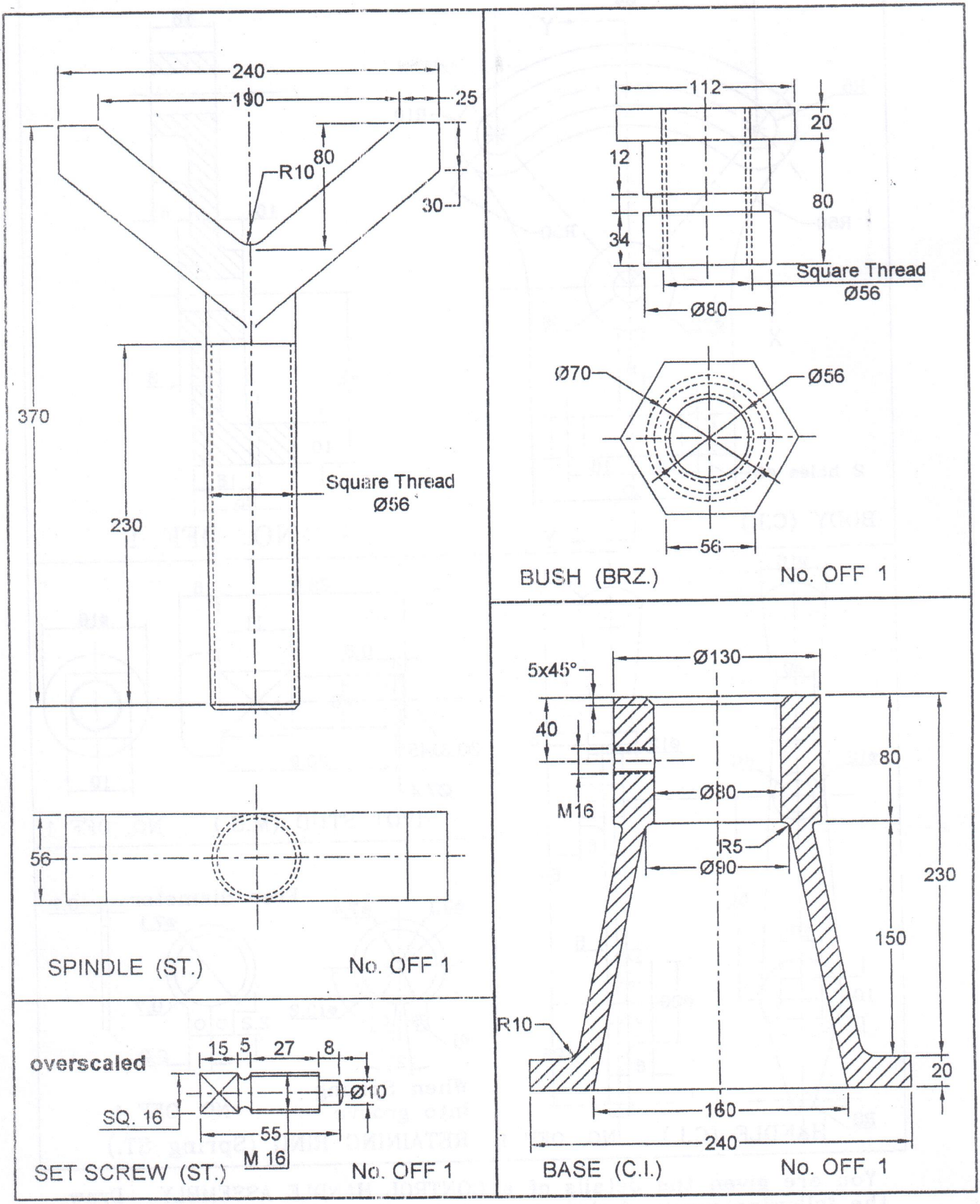
TOLERANCE Unit = 0.001 mm

		CLEARANCE							TRANSITION		INTERFERENCE	
		Coarse Tolerance	Loose Running Fit	Easy Running Fit	Normal running	Precision running	Average Location	light Push Fit	heavy Push Fit	Press Fit Ferrous	Heavy press Fit Non-Ferrous	
Basic Sizes (mm) over	TO	H11-C11	H9-d10	H9-e9	H8-f7	H7-g6	H7-h6	H7-k6	H7-n6	H7-p6	H7-s6	
-	3	+ 60 0	- 60 -120	+25 0	- 20 - 60	+25 0	- 14 - 39	+14 0	- 6 - 16	+10 0	- 2 - 8	+10 0	0 - 6	+10 + 6 0 0	+10 +10 0 +14	+10 +12 0 + 6	+10 0	+20 +14
3	6	+ 75 0	- 70 - 145	+30 0	- 30 - 70	+30 0	- 20 - 50	+18 0	- 10 - 28	+12 0	- 4 - 12	+12 0	0 - 8	+12 + 9 0 + 1	+12 +16 0 + 8	+12 +20 0 +12	+12 0	+27 +19
6	10	+ 90 0	- 80 - 170	+36 0	- 40 - 98	+36 0	- 25 - 61	+22 0	- 13 - 28	+15 0	- 5 - 14	+15 0	0 - 9	+15 +10 0 + 1	+15 +19 0 +10	+15 +24 0 +15	+15 0	+32 +23
10	18	+110 0	- 95 - 205	+43 0	- 50 -120	+43 0	-32 -75	+27 0	- 16 - 34	+18 0	- 6 - 17	+18 0	0 - 11	+18 +12 0 + 1	+18 +23 0 +12	+18 +29 0 +18	+18 0	+39 +28
18	30	+150 0	-110 -240	+52 0	- 65 -149	+52 0	-40 -92	+33 0	-20 - 41	+21 0	- 7 - 20	+21 0	0 - 13	+21 +15 0 + 2	+21 +28 0 +15	+21 +35 0 +22	+21 0	+48 +35
30	40	+160	-120 -280	+62	- 80	+62	- 50	+39	- 25	+25	- 9	+25	0	+25 +18	+25 +33	+25 +42	+25	+59
40	50	0	-130 -290	0	-180	0	-112	0	- 50	0	- 25	0	- 16	0 + 2	0 +17	0 +26	0	+43
50	65	+190	-140 -330	+74	-100	+74	- 60	+46	- 30	+30	- 10	+30	0	+30 +21	+30 +39	+30 +51	+30	+72 +53
65	80	0	-150 -340	0	-220	0	-134	0	- 60	0	- 29	0	- 19	0 + 2	0 +20	0 +32	0	+78 +59
80	100	+220	-170 -390	+87	-120	+87	- 72	+54	- 36	+35	- 12	+35	0	+35 +25	+35 +45	+35 +59	+35	+93 +71
100	120	0	-180 -400	0	-260	0	-159	0	- 71	0	- 34	0	- 22	0 + 3	0 +23	0 +37	0	+101 +79
120	140		-200 -450															+117 +92
140	160	+250 0	-210 -460	+100	-145 -305	+100	- 84 -185	+63 0	- 43 - 83	+40 0	- 14 - 39	+40 0	0 - 25	+40 +28 0 + 3	+40 +52 0 +27	+40 +68 0 +43	+40 0	+125 +100
160	180		-230 -480															+133 +108
180	200		-240 -530															+151 +122
200	225	+290 0	-260 -550	+115	-170 -355	+115	-100 -215	+72 0	- 50 - 93	+46 0	- 15 - 44	+46 0	0 - 29	+46 +33 0 + 4	+46 +60 0 +31	+46 +79 0 +50	+46 0	+159 +130
225	250		-280 -570															+169 +140
250	280	+320	-300 -620	+130	-190	+130	-110	+81	- 56	+52	- 17	+52	0	+52 +36	+52 +66	+52 +88	+52	+190 +158
280	315	0	-330 -650	0	-400	0	-240	0	-108	0	- 49	0	- 32	0 + 4	0 +34	0 +56	0	+202 +170
315	355	+360	-360 -720	+140	-210	+140	-125	+89	- 62	+57	- 18	+57	0	+57 +40	+57 +73	+57 +98	+57	+226 +190
355	400	0	-400 -760	0	-440	0	-265	0	-119	0	- 54	0	- 36	0 + 4	0 +37	0 +62	0	+244 +208
400	450	+400	-440 -840	+155	-230	+155	-135	+97	- 68	+63	- 20	+63	0	+63 +45	+63 +80	+63 +108	+63	+272 +232
450	500	0	-480 -880	0	-480	0	-290	0	-131	0	- 60	0	- 40	0 + 5	0 +40	0 +68	0	+292 +252



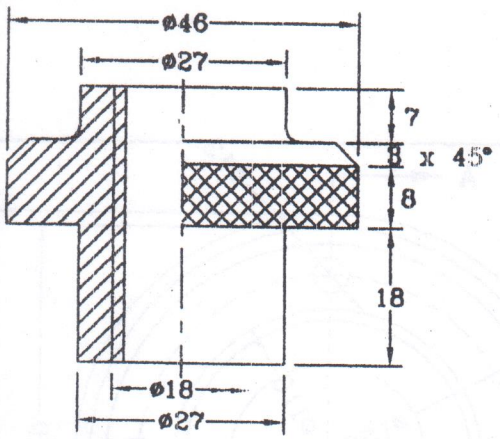
You are given the details of a CONTROL HANDLE ASSEMBLY. Draw the following views of the assembled unit, the handle being in the vertical position: a) ELEVATION b) SEC. SIDE VIEW (Y–Y)

Dimensions in MM All unspecified radii are R3

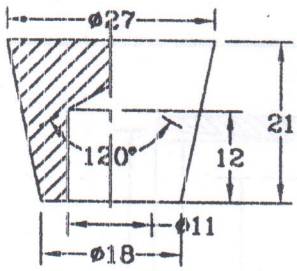


You are Given the details of a **SCREW JACK**. Assemble all parts, with spindle fixed at 50 mm from the Bush, and draw the following views:

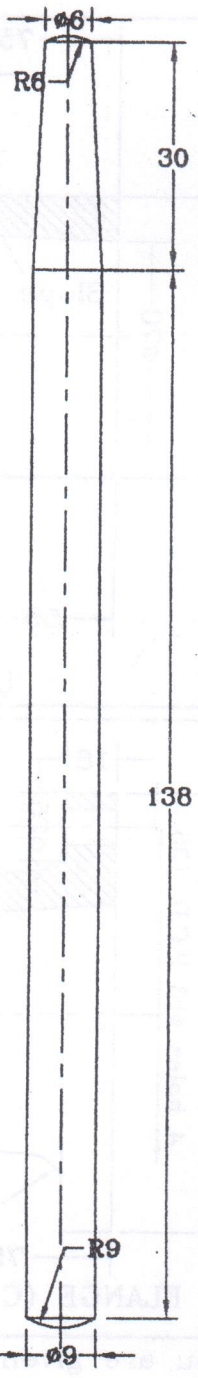
1- SEC. ELEVATION 2- H.SEC. SIDE VIEW 3- PLAN



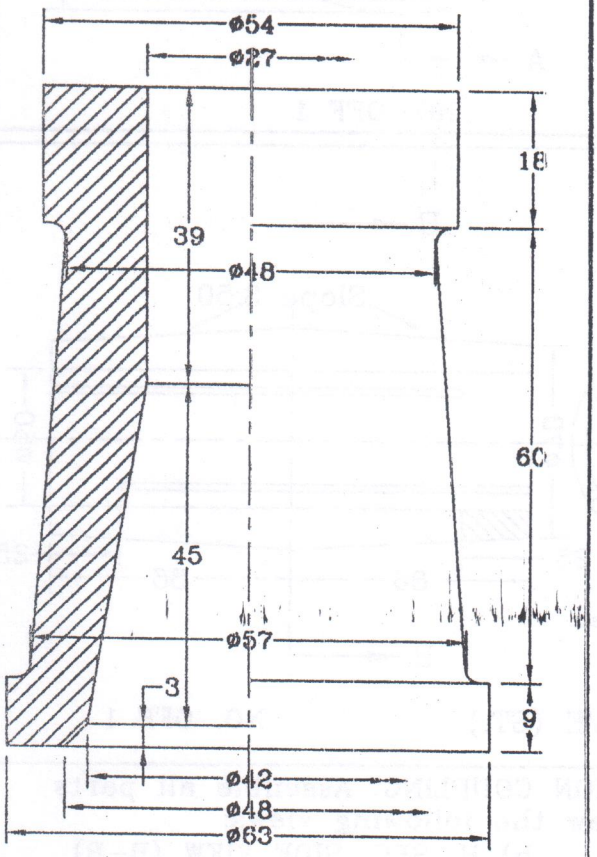
NUT (C.I.) NO. OFF 1



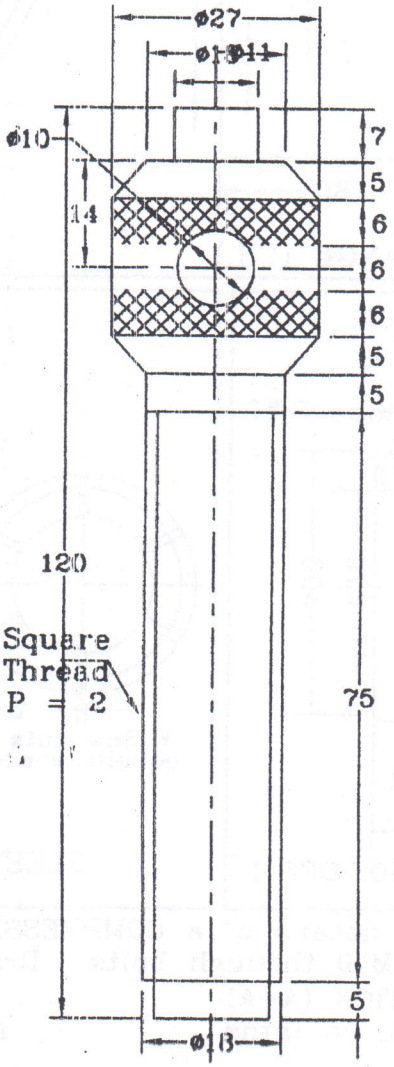
SUPPORT (ST.) NO. OFF 1



ARM (ST.) NO. OFF 1

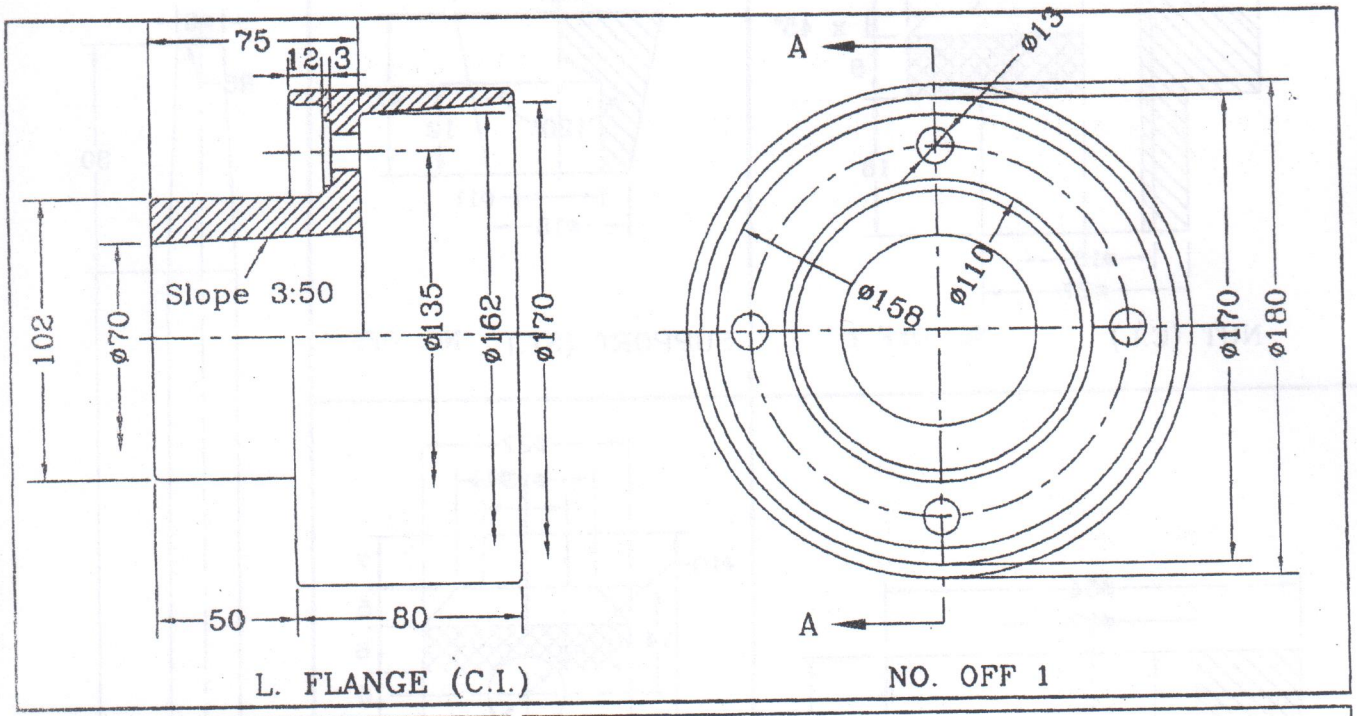


BODY (C.I.) NO. OFF 1

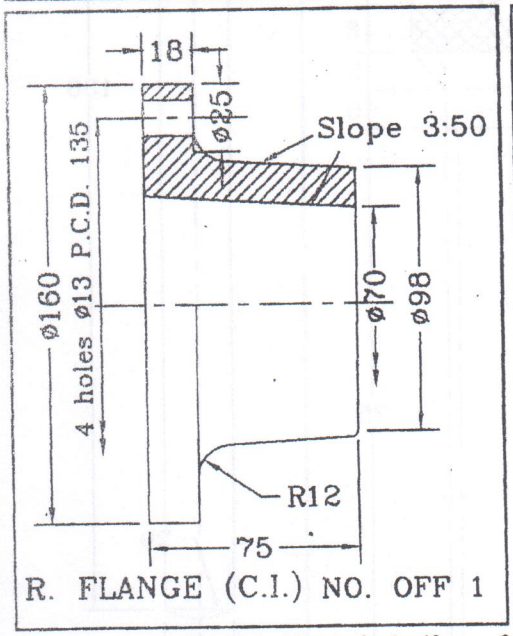


SCREW (ST.) NO. OFF 1

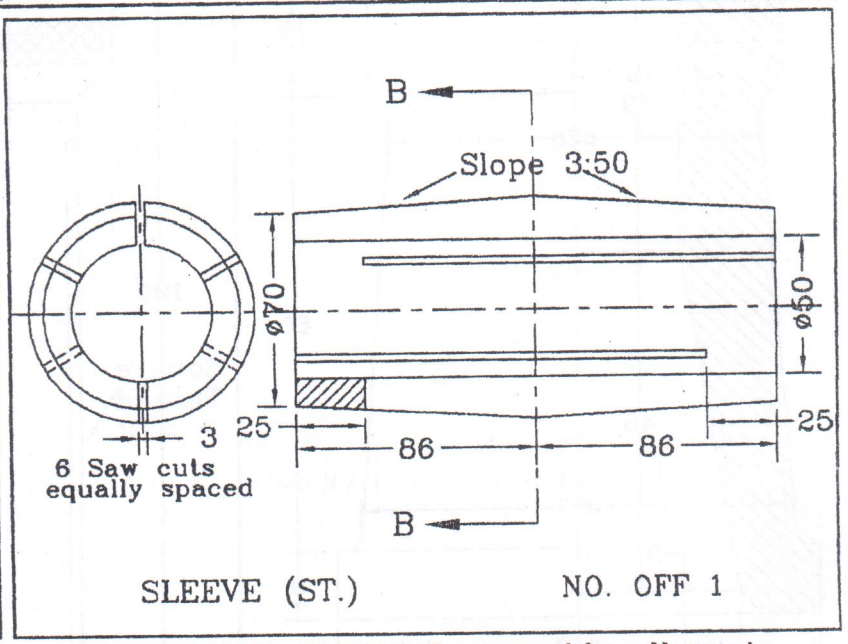
You are given the details of a **SCREW JACK**. Assemble all parts and draw the following views: a) H. SEC. ELEVATION b) PLAN
All dimensions in mms All unspecified radii are R2



L. FLANGE (C.I.) NO. OFF 1



R. FLANGE (C.I.) NO. OFF 1



SLEEVE (ST.) NO. OFF 1

You are given the details of a COMPRESSION COUPLING. Assenble all parts using 4 M10 through bolts. Draw the following views:

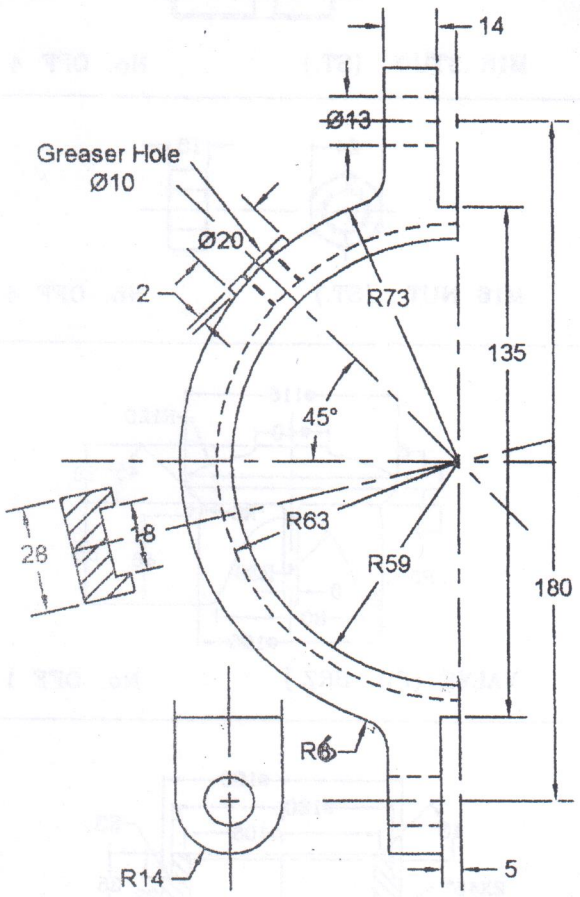
a) H. SEC. ELEVATION (A–A)

b) H. SEC. SIDE VIEW (B–B)

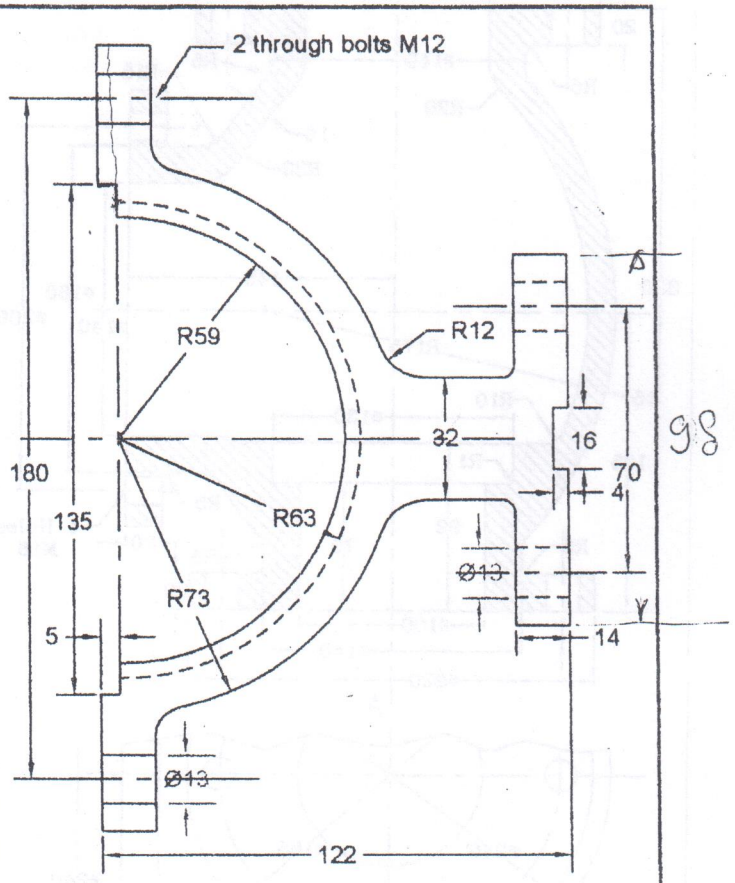
All dimensions in mms

All unspecified radii are R3

6/10/14

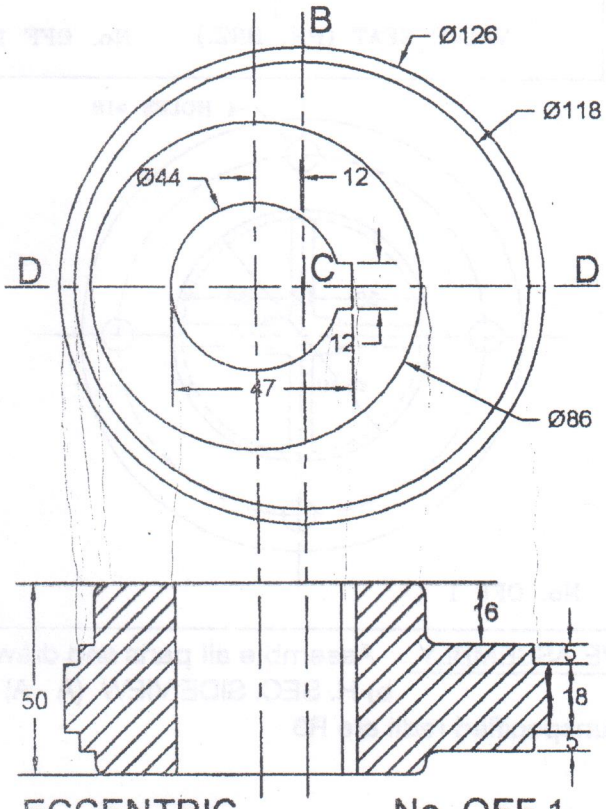


L. H. CAP No. OFF 1



R. H. CAP No. OFF 1

98



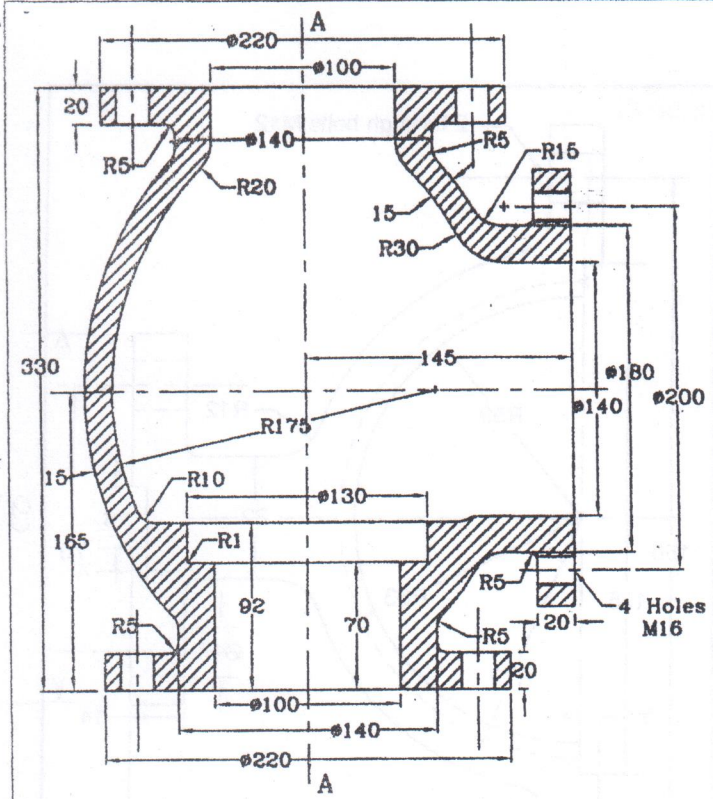
ECCENTRIC No. OFF 1

You Are given the details of an
ECCENTRIC ASSEMBLY

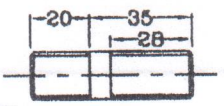
Assemble All Parts using two M12 through bolts and draw the following views:

1- H.SEC. ELEVATION
2- H.SEC. SIDE VIEW (B-C-D)
3- PLAN

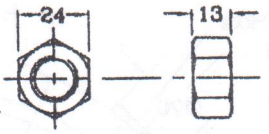
All dimensions in mms
All unspecified radii are R3



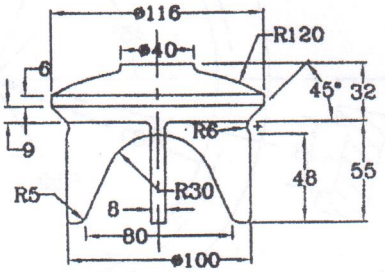
VALVE BODY (BRZ.) No. OFF 1



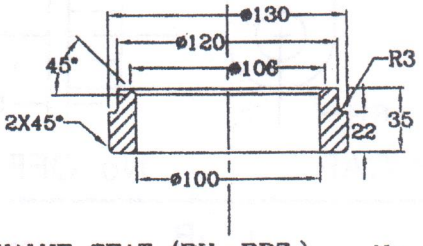
M16 STUD (ST.) No. OFF 4



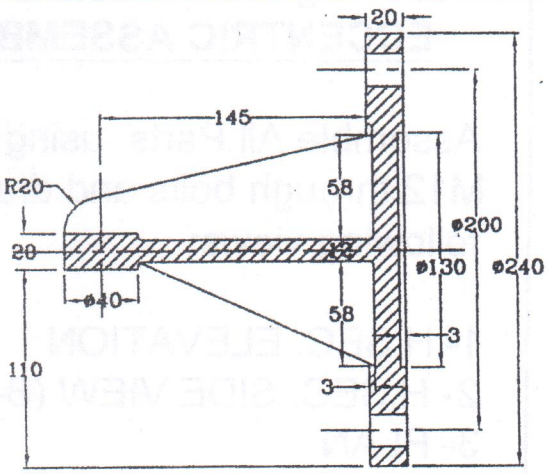
M16 NUT (ST.) No. OFF 4



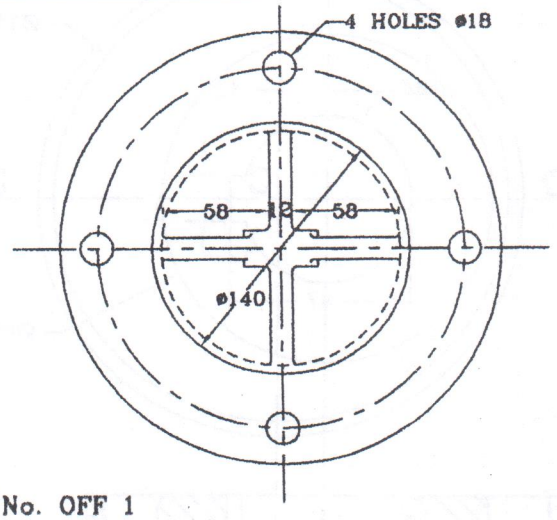
VALVE (PH. BRZ.) No. OFF 1



VALVE SEAT (PH. BRZ.) No. OFF 1

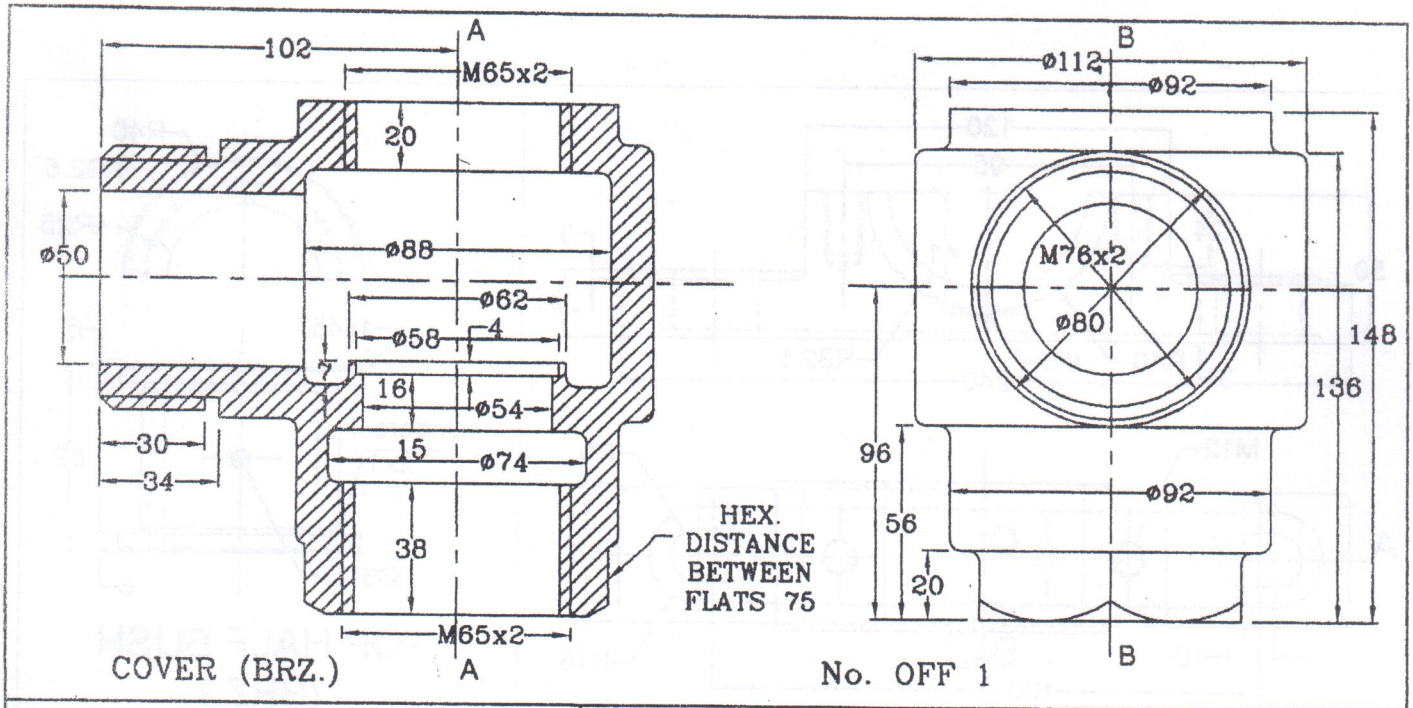


VALVE BODY (BRZ.) No. OFF 1

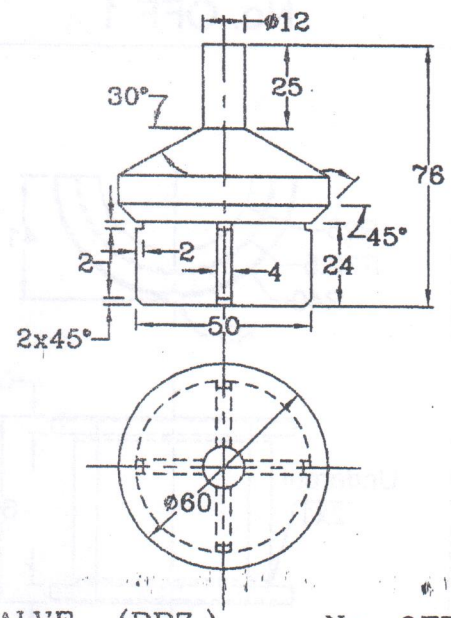


You are given the details of a NON - RETURN VALVE ASSEMBLY . Assemble all parts and draw the following views: a) SEC. ELEVATION b) H. SEC. SIDE VIEW (A - A)

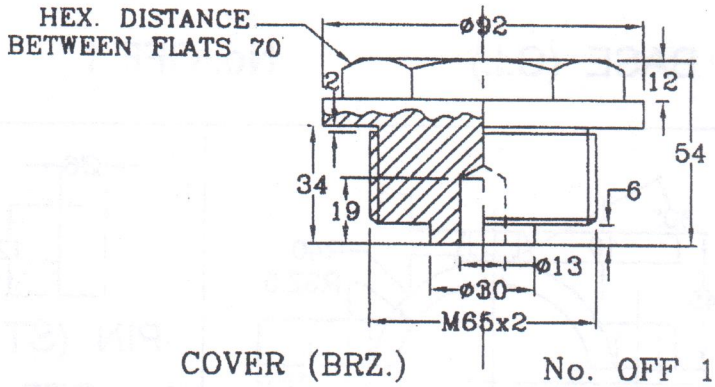
All dimensions in mm All unspecified radii are R3



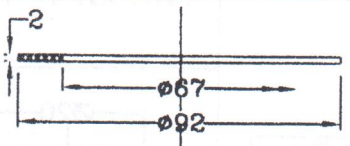
COVER (BRZ.) No. OFF 1



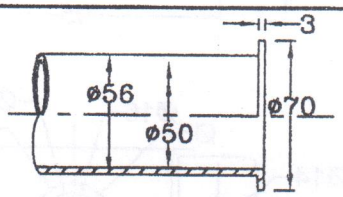
VALVE (BRZ.) No. OFF 1



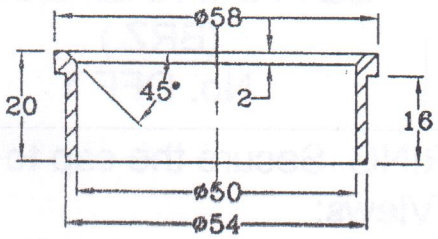
COVER (BRZ.) No. OFF 1



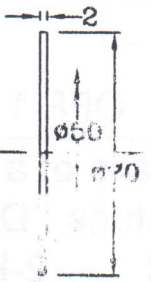
GASKET (ASBESTOS)
No. OFF 1



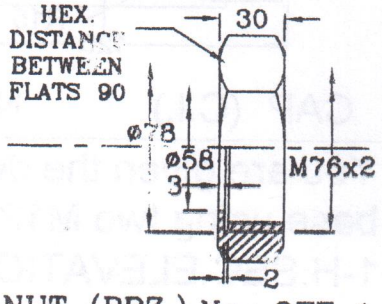
PIPE END (BRZ.)
No. OFF 1



VALVE SEAT (BRZ.) No. OFF 1



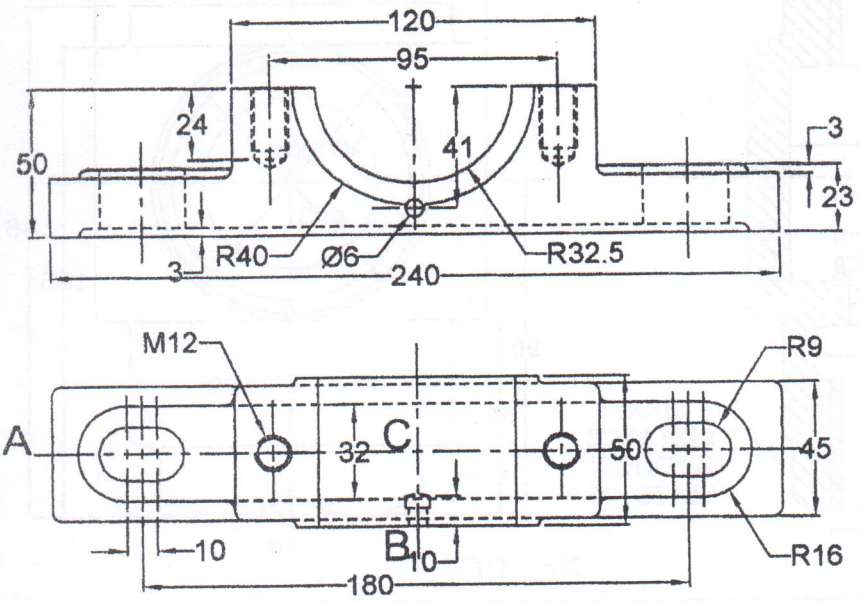
(ASBESTOS)
No. OFF 1



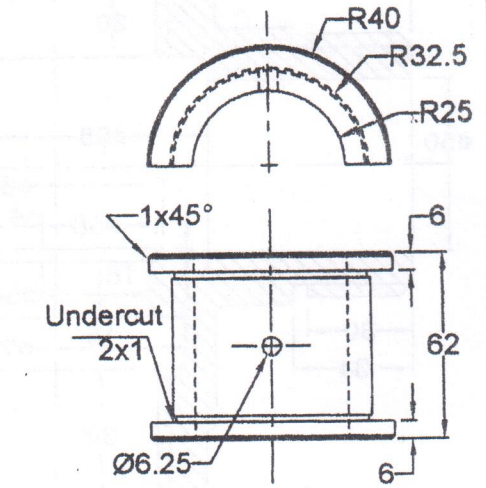
NUT (BRZ.) No. OFF 1

You are given the details of a NON - RETURN VALVE ASSEMBLY. Assemble all parts and draw the following views: a) SEC. ELEVATION b) H. SEC. SIDE VIEW c) PLAN

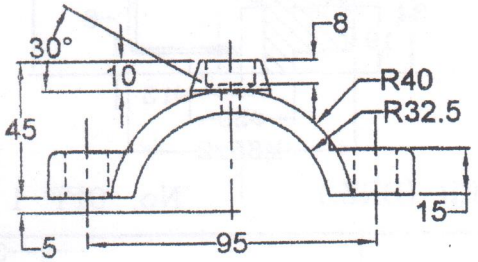
All dimensions in mm All unspecified radii are R3

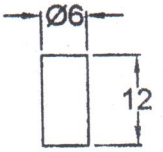


BASE (C.I.) No. OFF 1

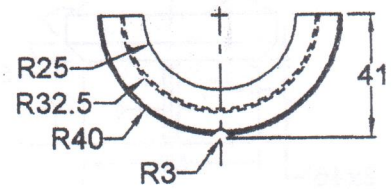


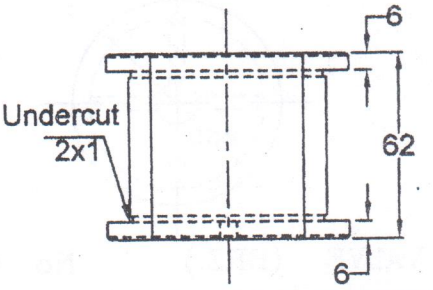
TOP HALF BUSH
(BRZ.)
No. OFF 1



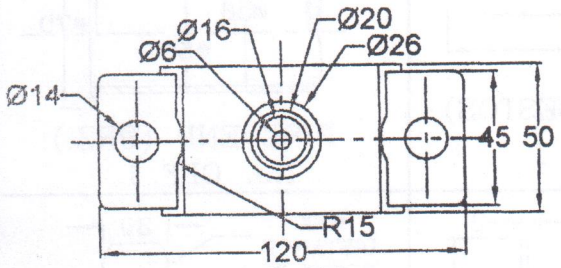


PIN (ST.)
No. OFF 1

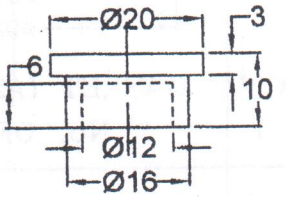




BOTTOM HALF BUSH
(BRZ.)
No. OFF 1



CAP (C.I.) No. OFF 1

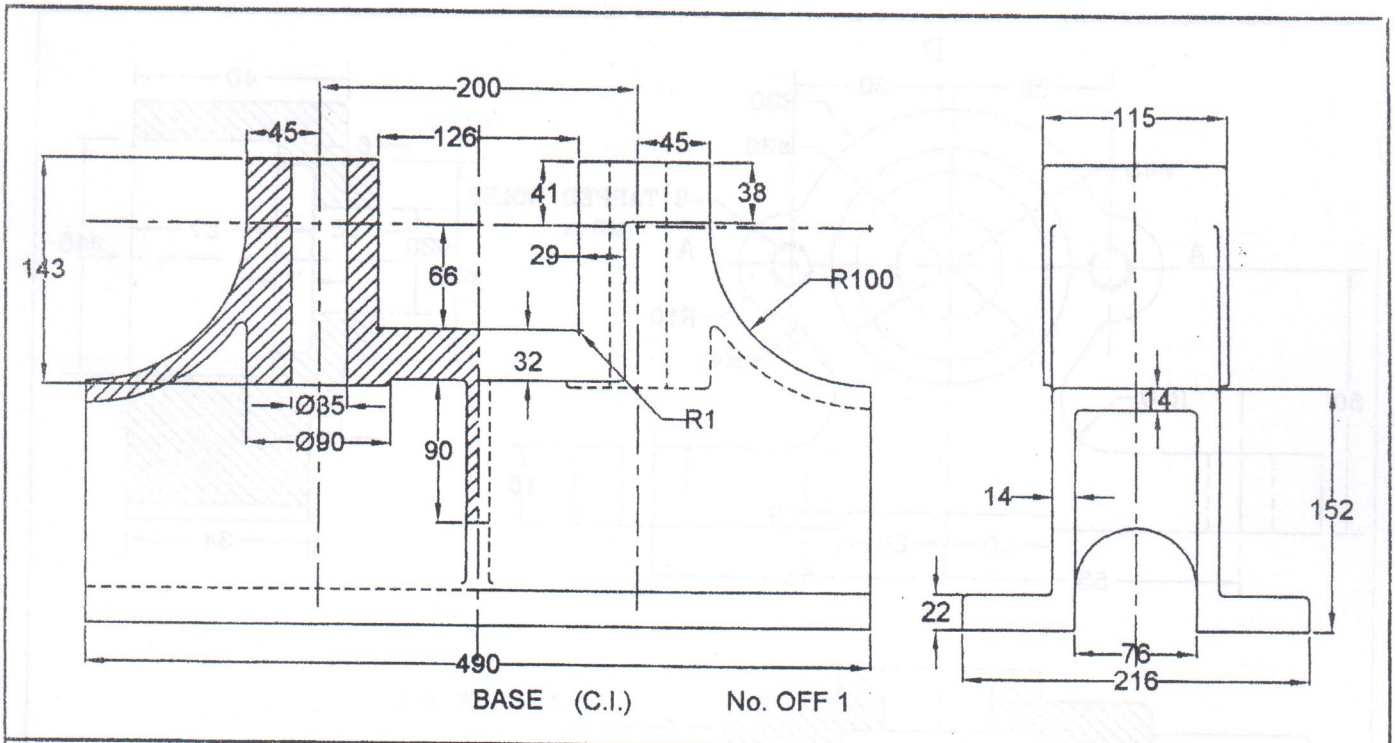


COVER (ST.)
No. OFF 1

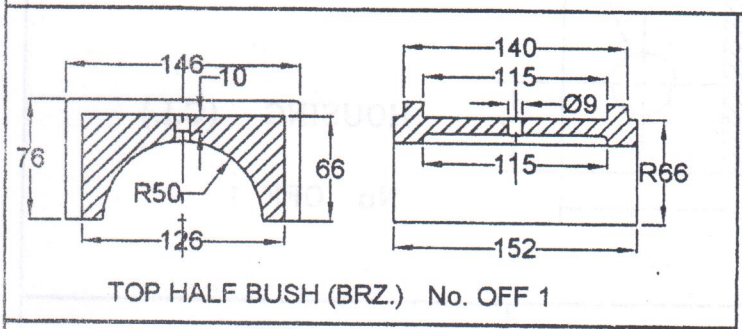
You are given the details of a JOURNAL BEARING. Secure the cap to the base using two M12 studs . Draw the following Views:

1-H.SEC.ELEVATION 2-H.SEC.SIDE VIEW(A-C-B) 3-PLAN

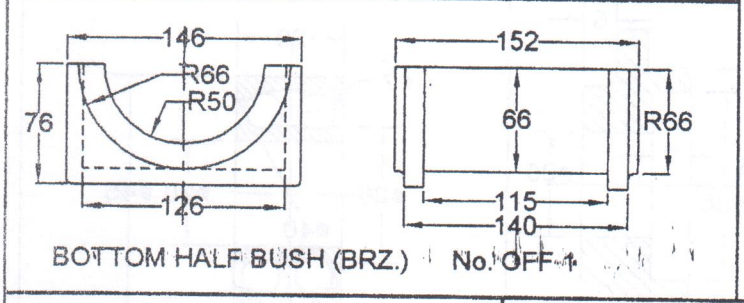
All unspecified radii are R3. All dimensions are in mm .



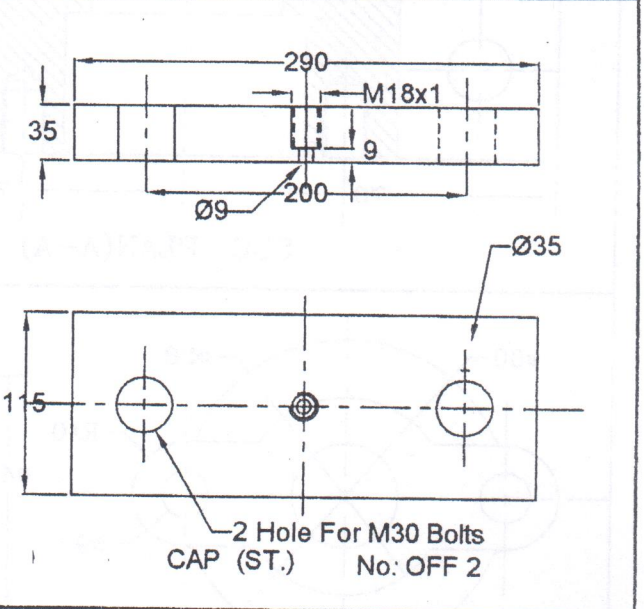
BASE (C.I.) No. OFF 1



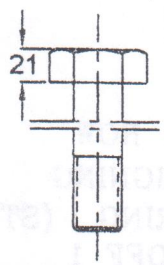
TOP HALF BUSH (BRZ.) No. OFF 1



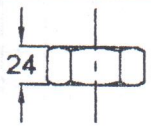
BOTTOM HALF BUSH (BRZ.) No. OFF 1



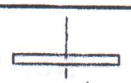
CAP (ST.) No: OFF 2



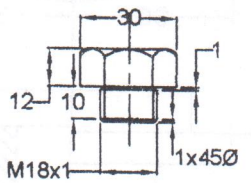
THROUGH BOLTS M30 (ST.)
No. OFF 2



NUT M30 (ST.) No. OFF 2



WASHER For M30 NUT (ST.)
No. OFF 2

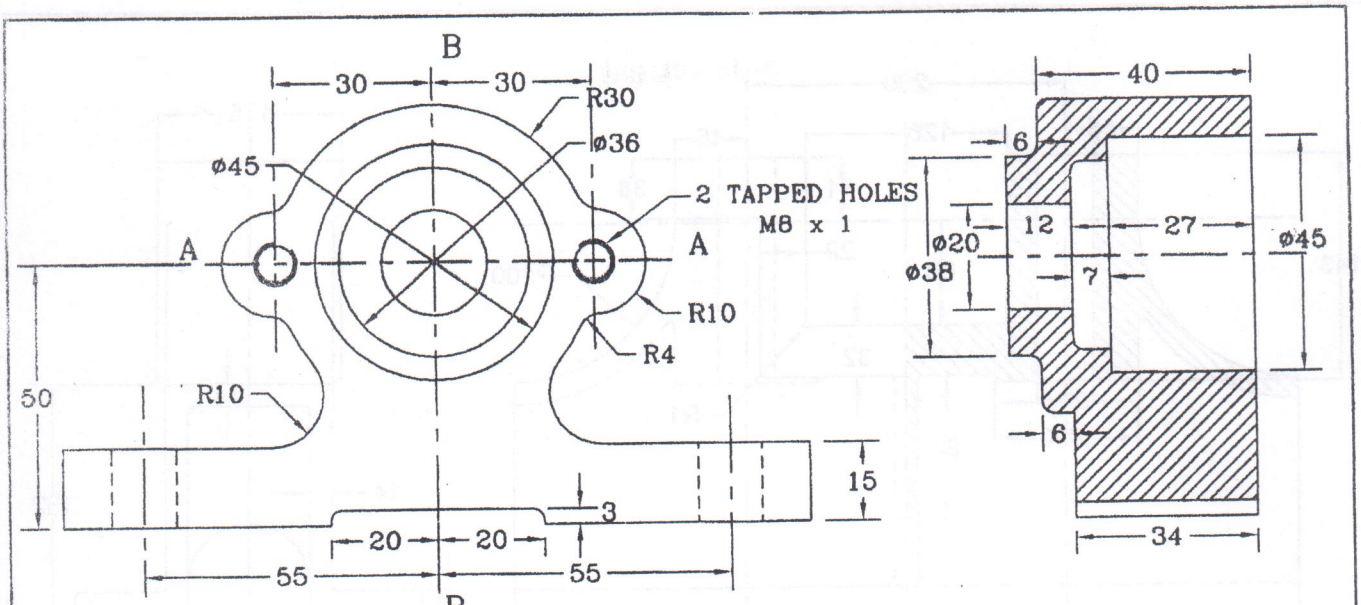


PLUG (ST.)
No. OFF 1

You are given the details of a **JOURNAL BEARING** . Assemble All Parts and Draw the following views:

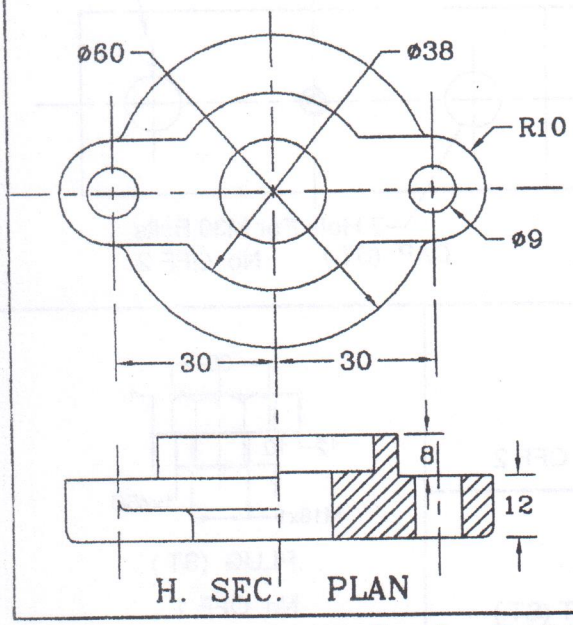
a) H. SEC. ELEVATION
All dimensions in mm

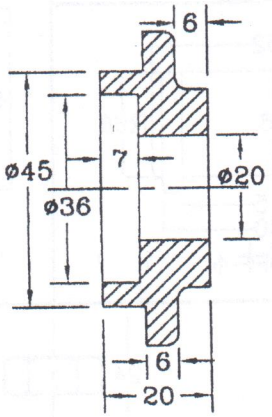
b) SEC. SIDE VIEW (A - A)
All unspecified radii are R3



HOUSING (C.I.)

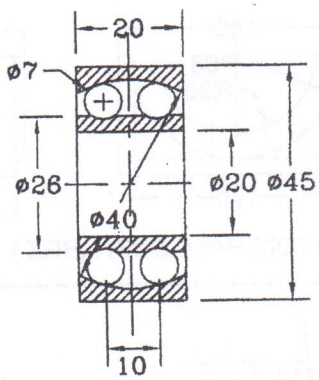
No. OFF 1





COVER (C.I.)

No. OFF 1



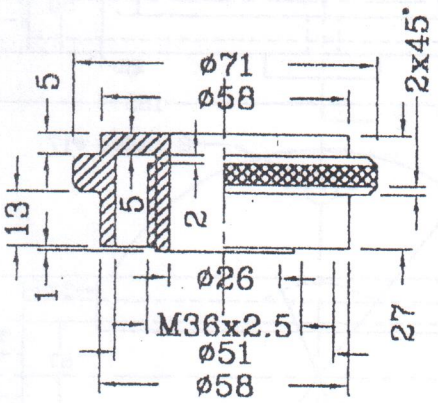
DOUBLE ROW
SELF–ALIGNING
BALL BEARING (ST.)
No. OFF 1

You are given the details of a **BALL BEARING ASSEMBLY**. Assemble the bearing in position and secure the cover with two M8 Tap bolts. Draw to the following views:

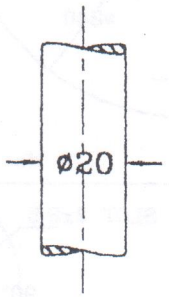
a) ELEVATION b) SEC. SIDE VIEW (B - B) c) H. SEC. PLAN (A - A)

All dimensions in mm. All unspecified Radii are R2

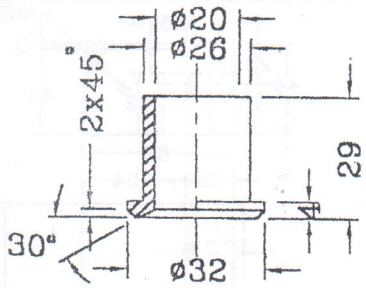
STUFFING BOX



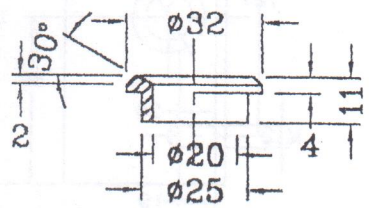
GLAND(BRZ.) NO. OFF1



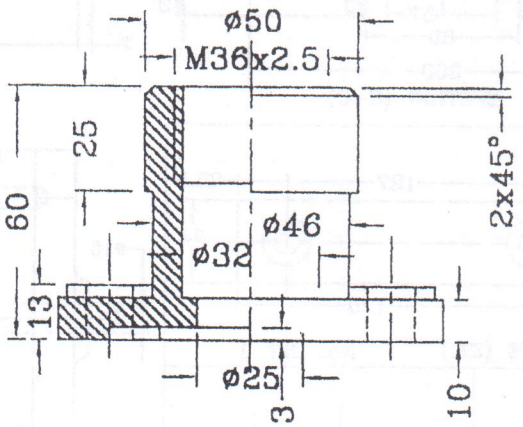
SHAFT(ST.) NO. OFF1



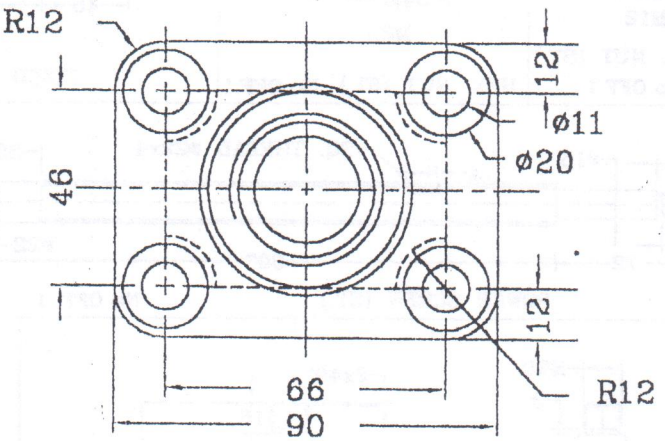
BUSH(BRZ.) NO. OFF1



BUSH(BRZ.) NO. OFF1



H. SEC. ELEV.



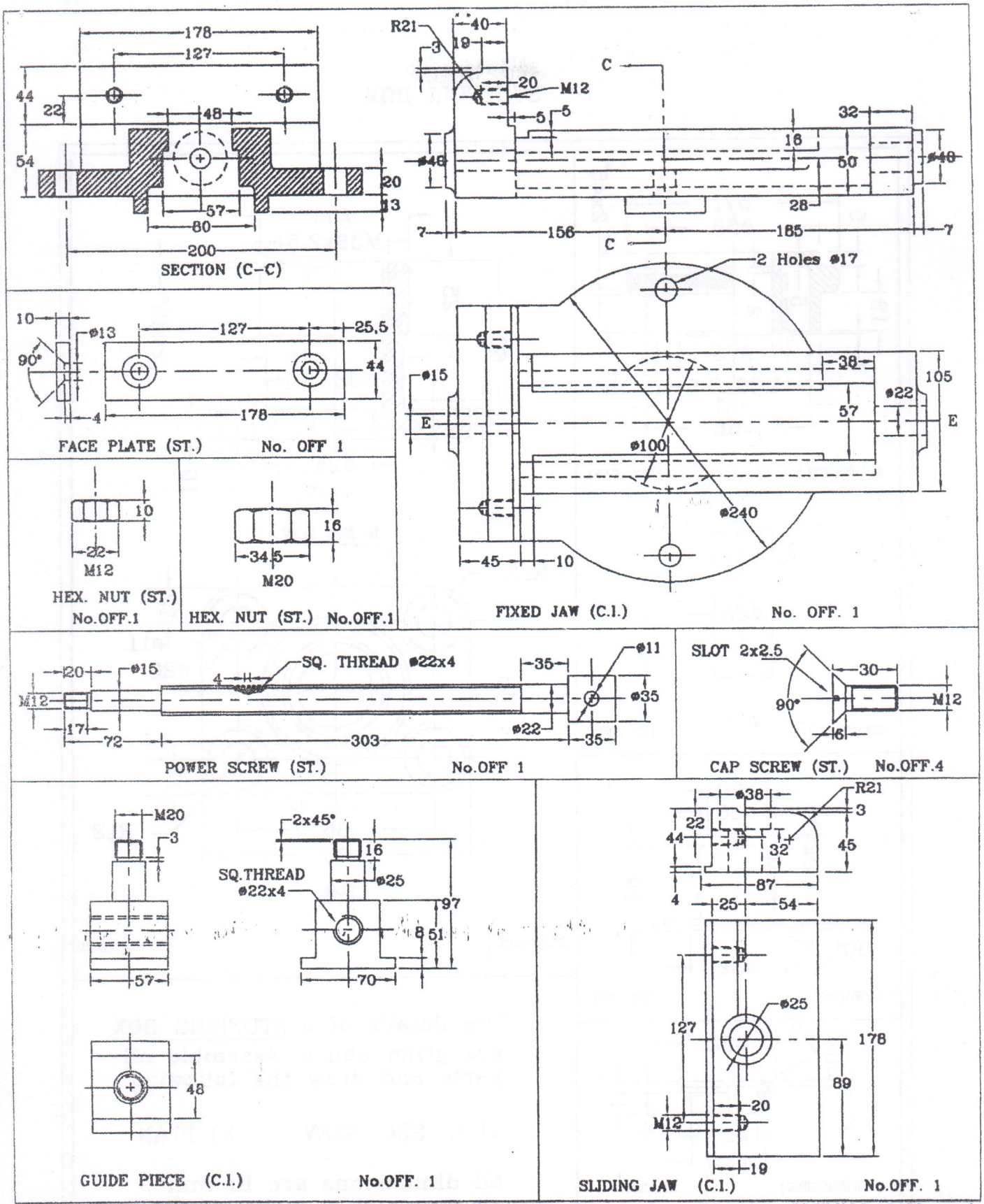
PLAN

BODY(BRZ.) NO. OFF1

The details of a STUFFING BOX are given above. Assemble all parts and draw the following:

a) H. SEC. ELEV. b) PLAN

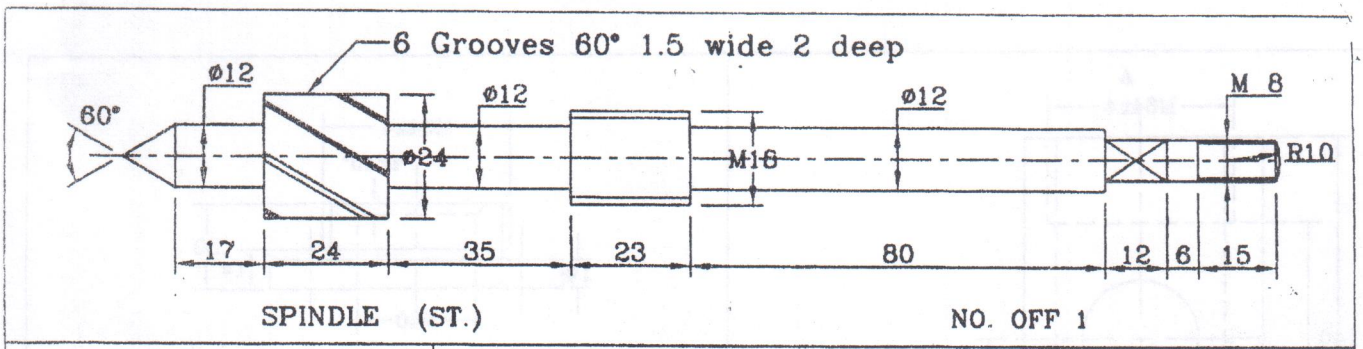
All dimensions are in mm .
All unspecified radii are R2 .



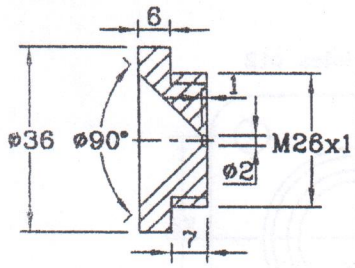
You are given the details of a VICE. Assemble all parts with the SLIDING JAW and FIXED JAW 100 mm apart. Draw to FULL SIZE the following:

a) SECTION ELEVATION (E-E) b) PLAN

All Dimensions in mm. All Unspecified radii are R3



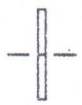
SPINDLE (ST.) NO. OFF 1



NOZZLE (ST.)

NO. OFF 1

washer for M8 screw

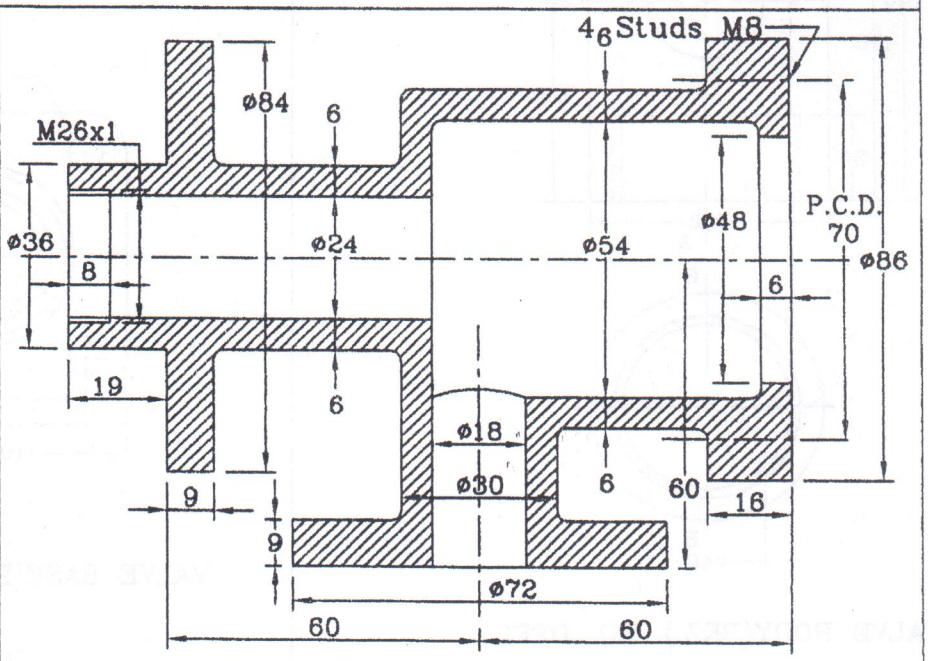


WASHER (ST.)

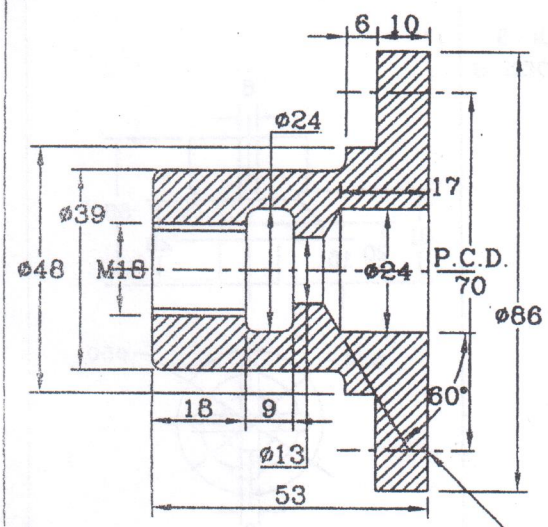
NO. OFF 1

NUT (ST.)

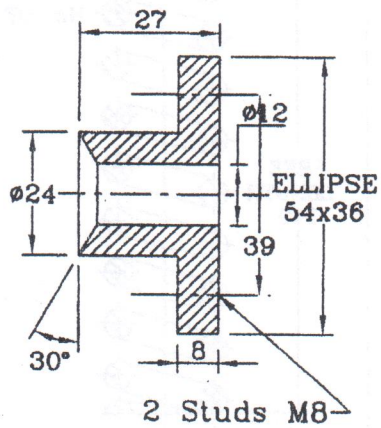
NO. OFF 1



BODY (BRZ.) NO. OFF 1

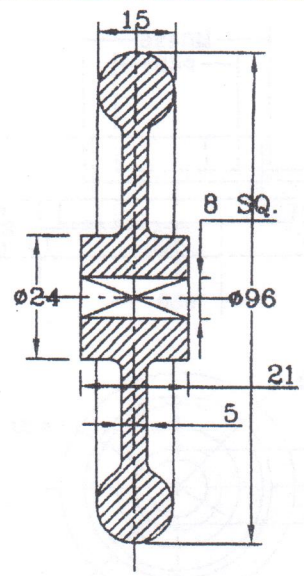


COVER (BRZ.) NO. OFF 1



GLAND (BRZ.)

NO. OFF 1

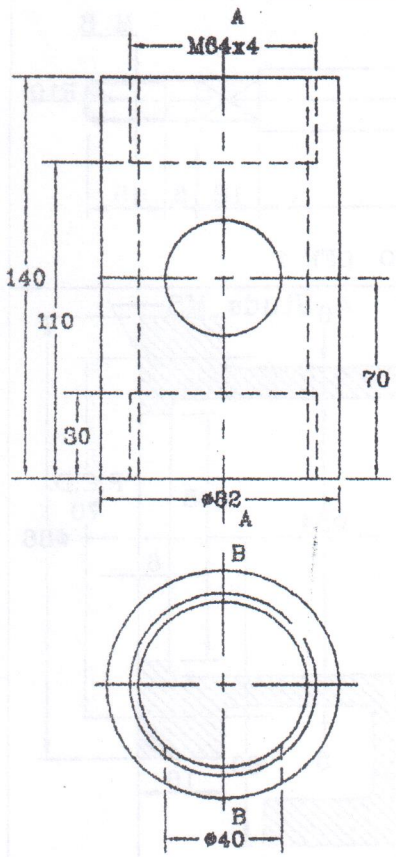


HANDWHEEL (BRZ.)

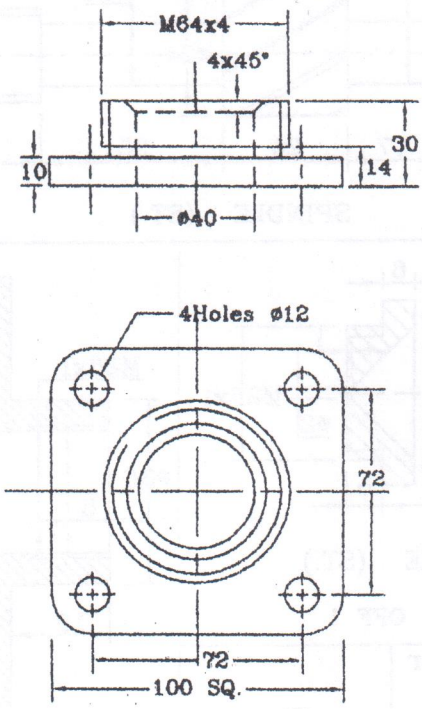
NO. OFF 1

You are given the details of an OIL BURNER. Assemble all parts and draw the following: a) SEC. ELEVATION b) SIDE VIEW c) PLAN

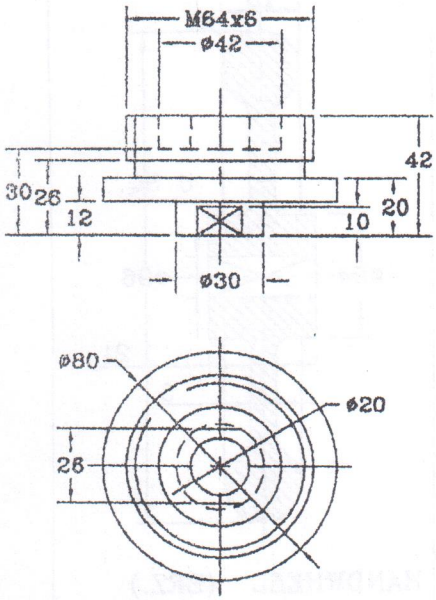
All Dimensions in mms All unspecified Radii are R2



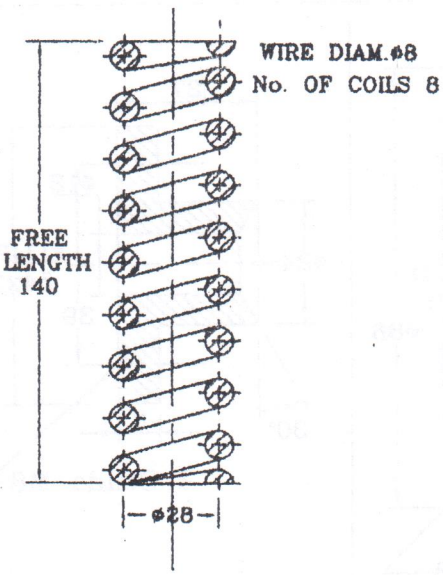
VALVE BODY(BRZ.) NO. OFF1



VALVE BASE(BRZ.) NO. OFF1

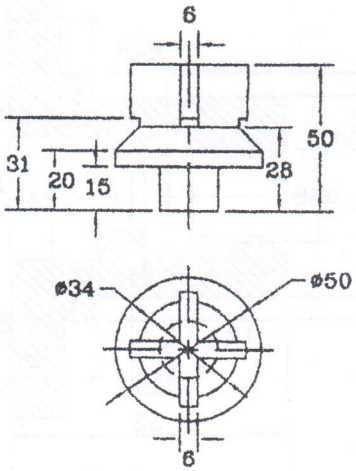


COVER(BRZ.) NO. OFF1



SPRING(ST.)

NO. OFF1

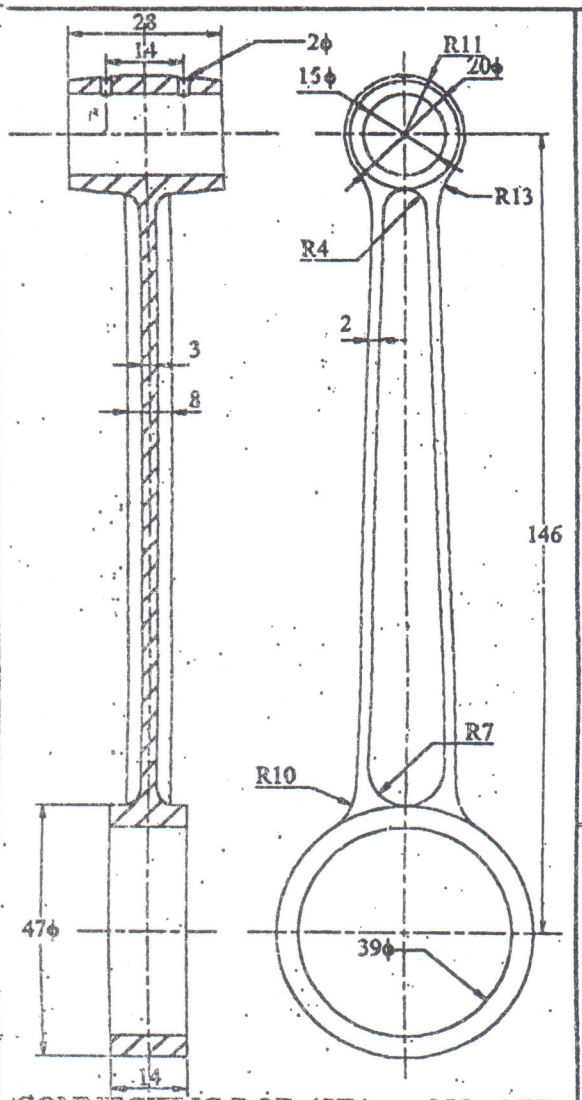


VALVE(BRZ.)
NO.OFF1

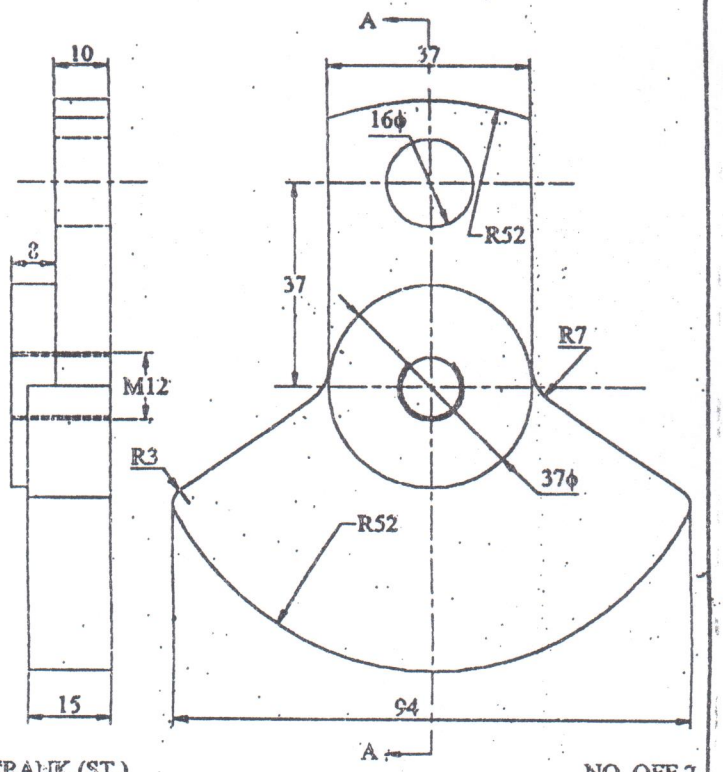
You are given the details of a **SAFETY VALVE** . Assemble all parts and draw to full size :

1- SEC. ELEV.(A-A) 2- SIDE VIEW 3- H. SEC. PLAN (B-B)

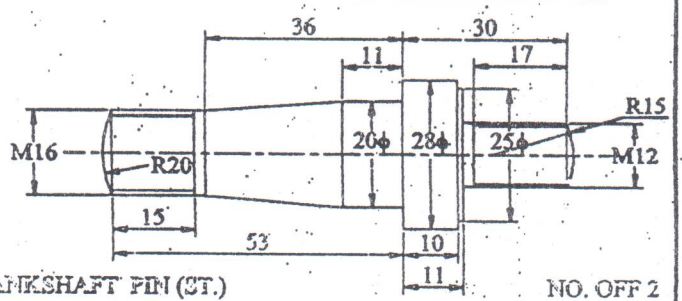
All dimensions are in mm All unspecified radii are R2 .



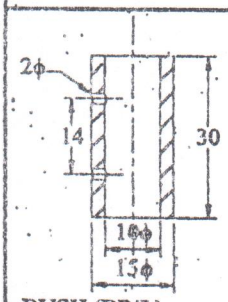
CONNECTING ROD (ST.) NO. OFF 1



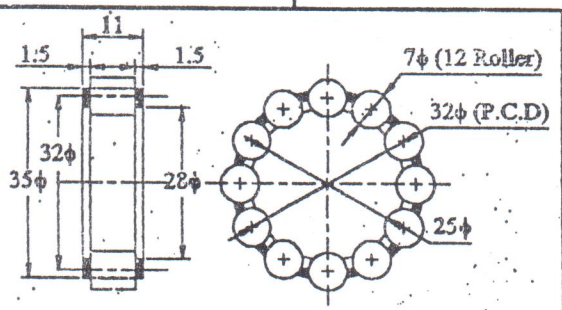
CRANK (ST.) NO. OFF 2



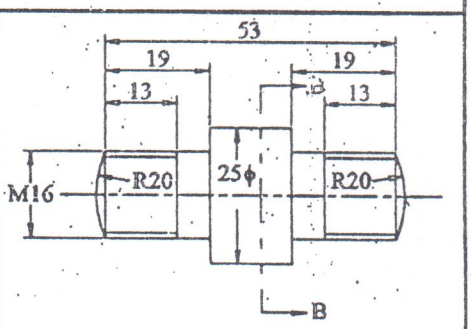
CRANKSHAFT PIN (ST.) NO. OFF 2



BUSH (BRZ.)
NO. OFF 1

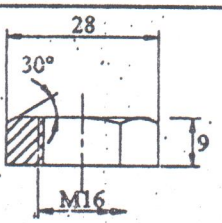


ROLLER BEARING (ST.) NO. OFF 1

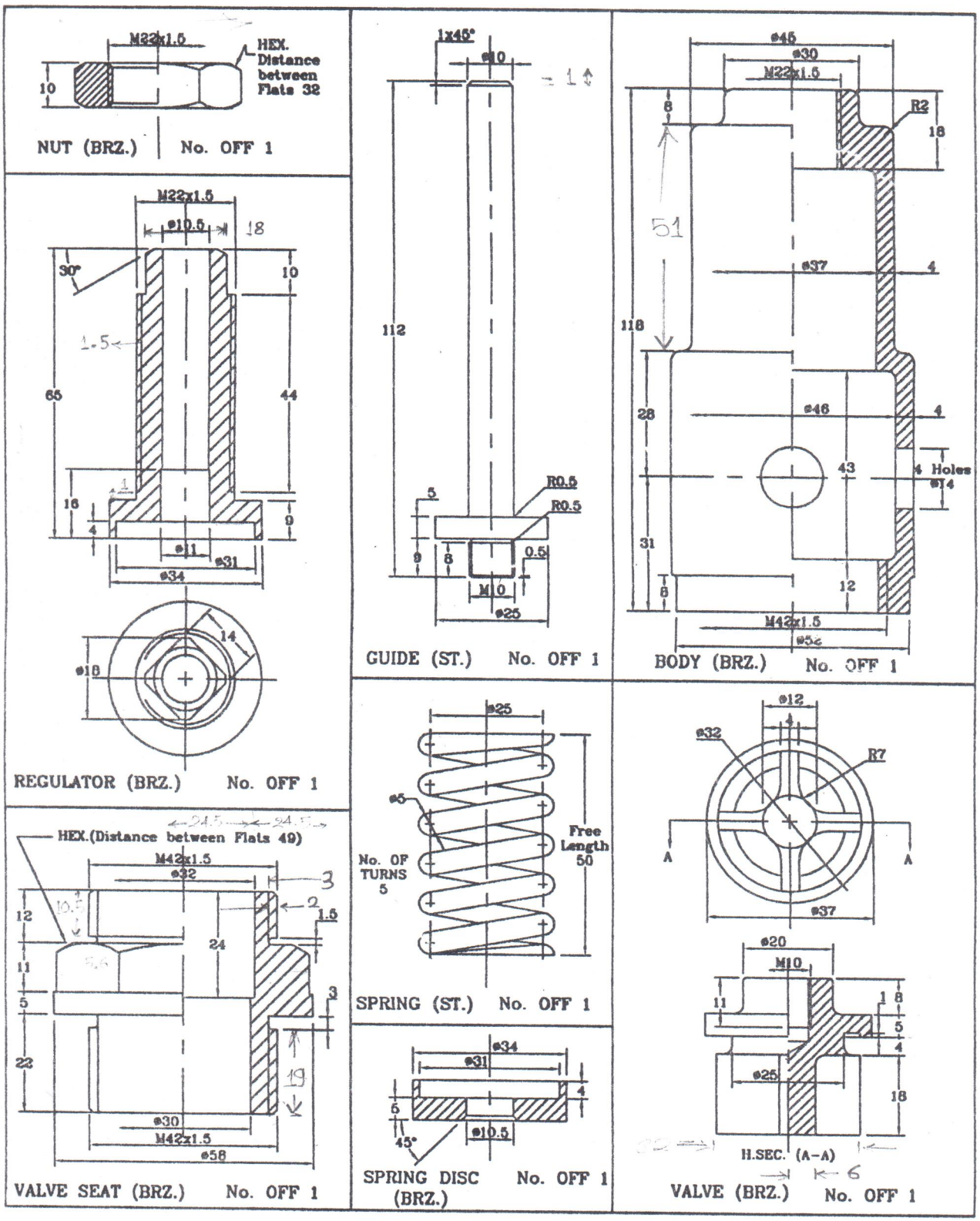


COIL ROD PIN (ST.) NO. OFF 1

Given above the details of a CRANKSHAFT AND CONNECTING ROD ASSEMBLY. Assemble all parts and draw the following:
1- SEC. ELEV. (A-A) 2- SEC. SIDE VIEW (B-B)
All dimensions are in mm.



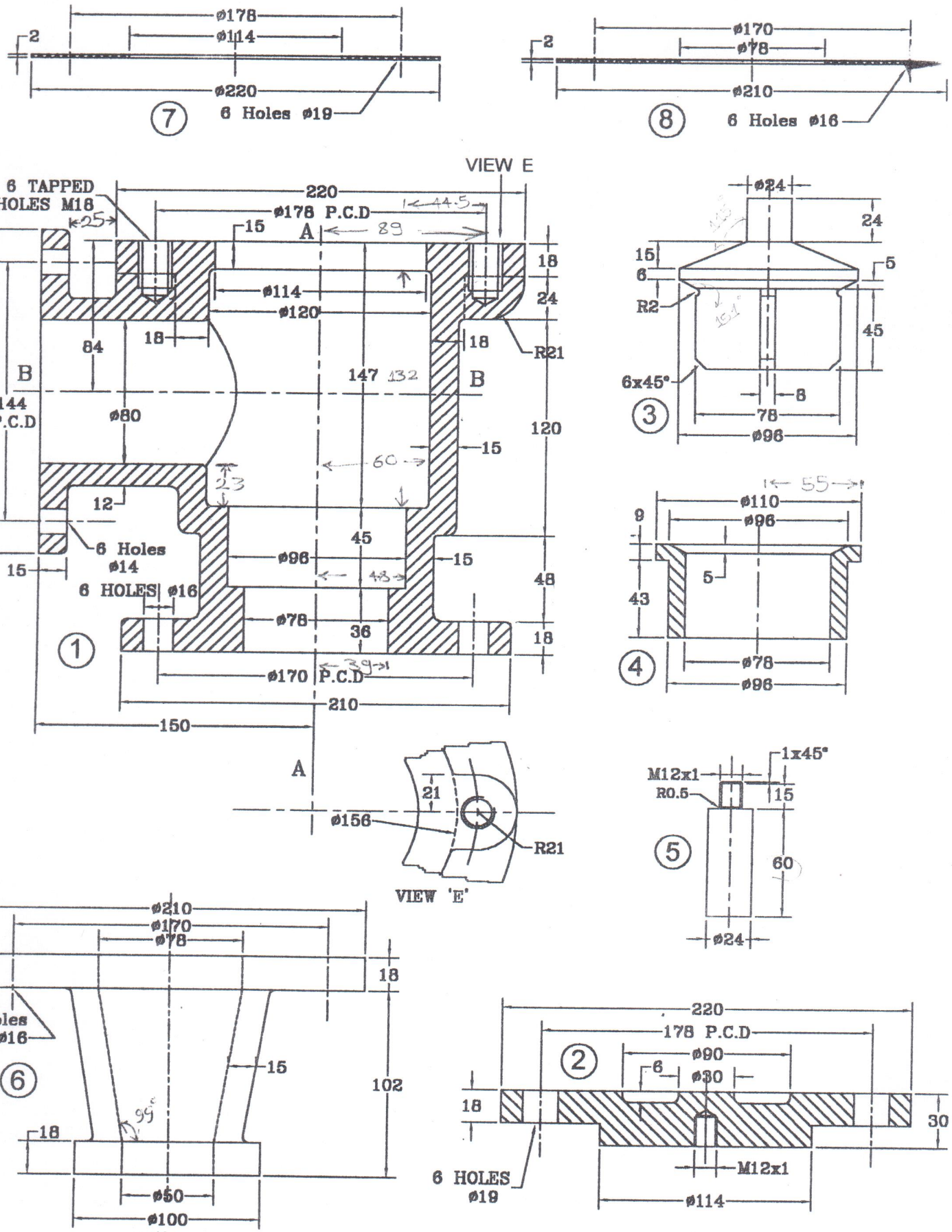
NUT (ST.) NO. OFF 2



You are given the details of á SAFETY VALVE ASSEMBLY. Assemble all parts with the spring compressed to a length of 45 mm and draw the following views:

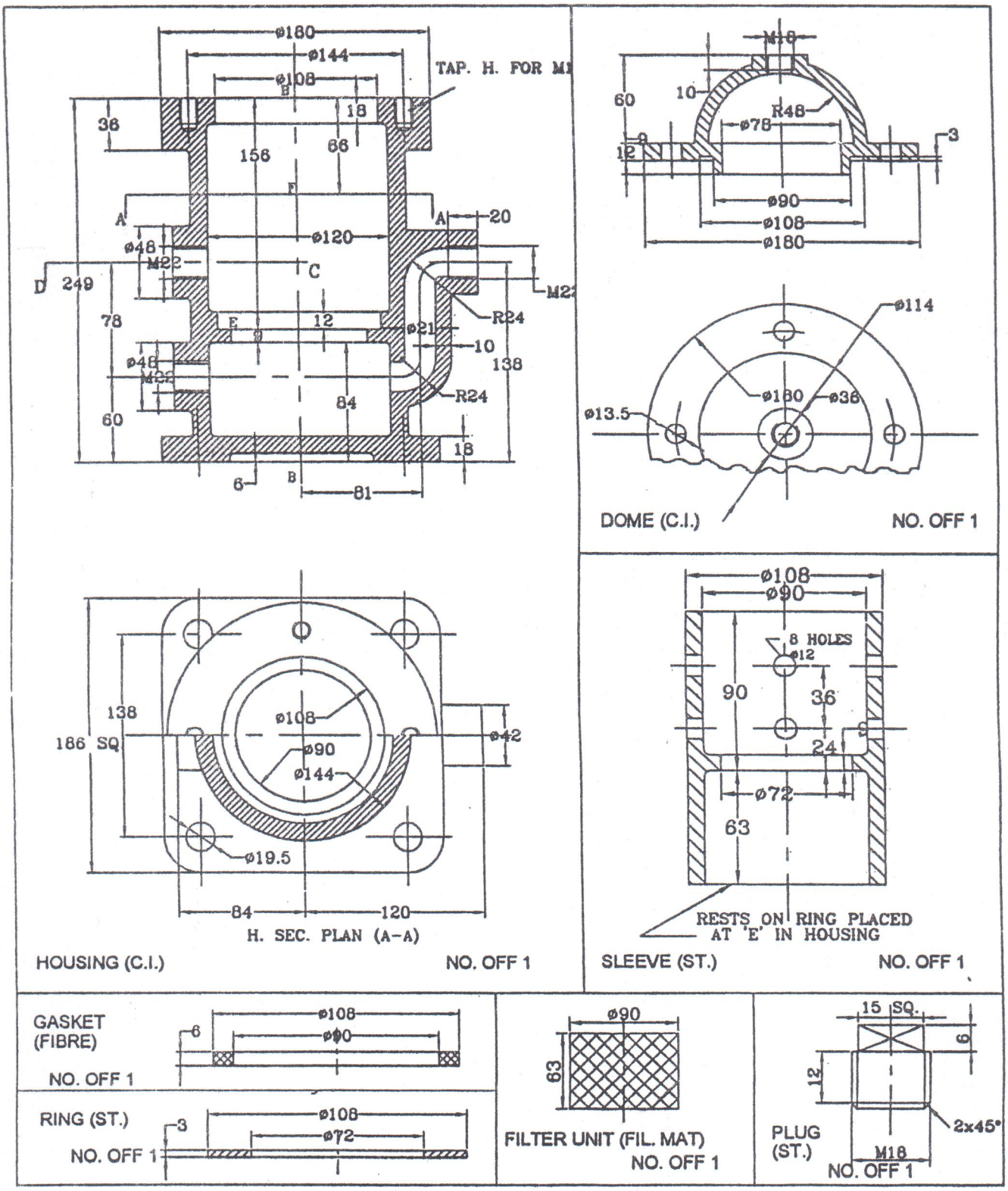
a) SEC. ELEVATION b) SIDE VIEW c) PLAN

All dimensions in mm All unspecified radii are R2



You are given the details of a NON RETURN VALVE
Assemble all parts and draw to full size the following :

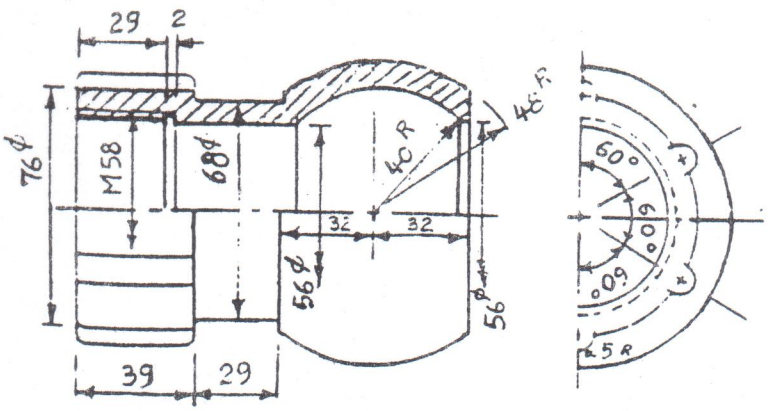
1- Section Elevation
2- Half Section Side View



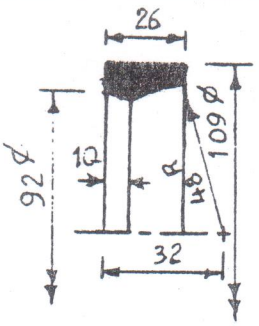
You are given the details of a **FILTER**. Assemble all parts and draw the following:

a) SEC. ELEV. b) H. SEC. SIDE VIEW (B-B) c) SEC. PLAN (AFCD)

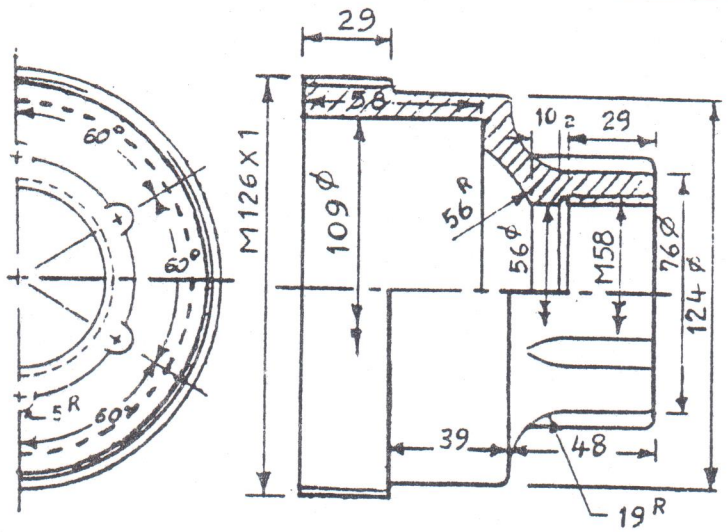
All dimensions in MM All unspecified radii are R3



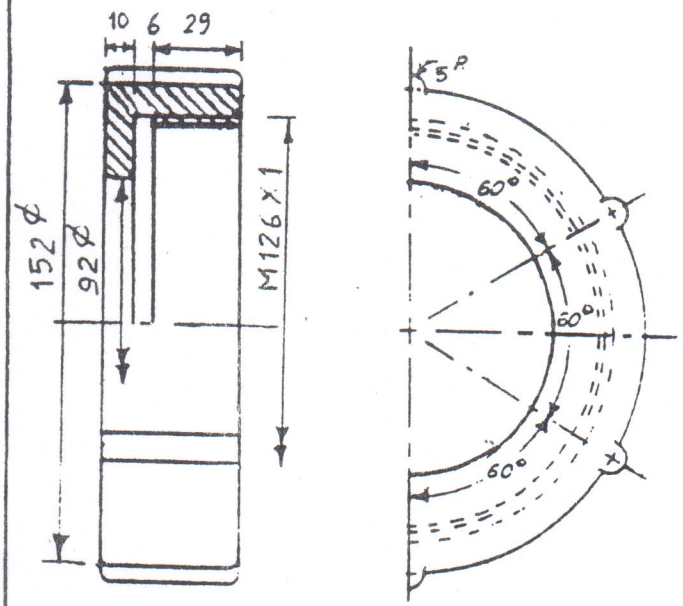
BALL FITTING (ST.) NO. OFF 1



PACKING RING (FIBRE) NO. OFF 2



THREADED FITTING (ST.) NO. OFF 1



GLAND (ST.) NO. OFF 1

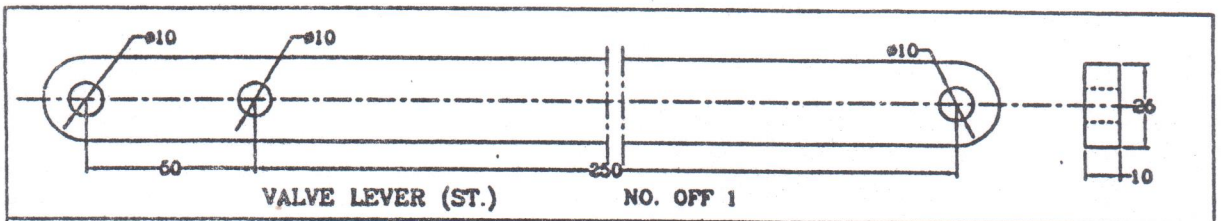
You are given the details of a BALL JOINT. Assemble all parts and draw to full size the following views:

1- H. SEC. ELEV.

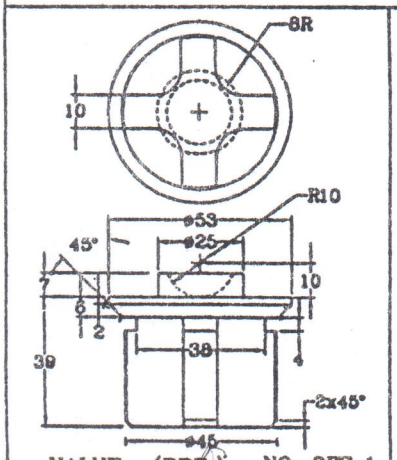
2- SIDE VIEW

All dimensions are in mm.

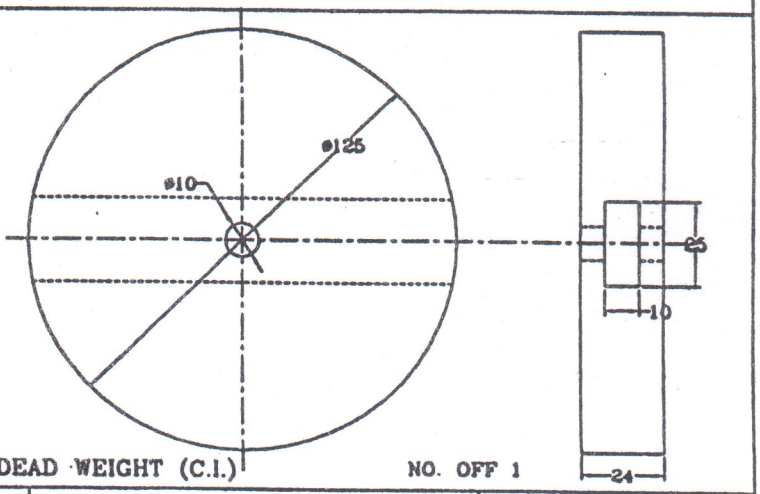
All unspecified radii are 2R.



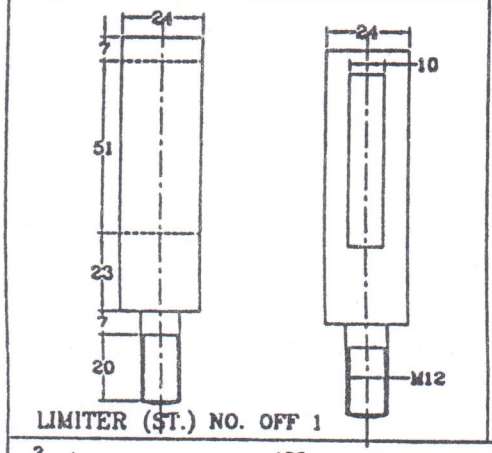
VALVE LEVER (ST.) NO. OFF 1



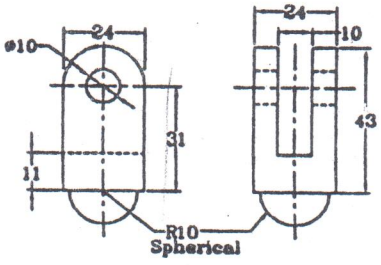
VALVE (BRZ.) NO. OFF 1



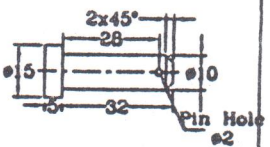
DEAD WEIGHT (C.I.) NO. OFF 1



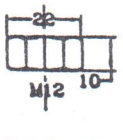
LIMITER (ST.) NO. OFF 1



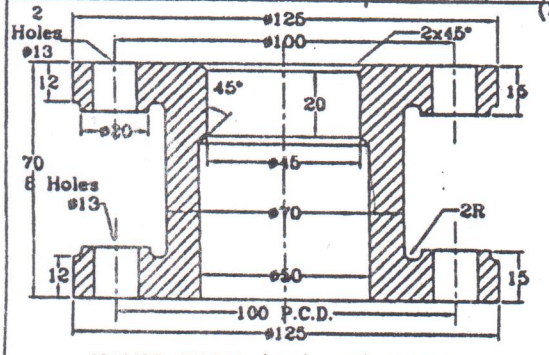
VALVE PIVOT (ST.) NO. OFF 1



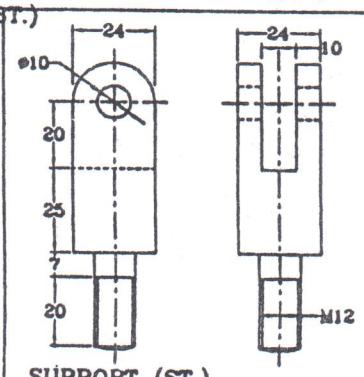
PIN (ST.) NO. OFF 3



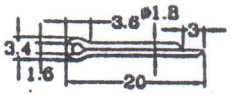
NUT (ST.) NO. OFF 3



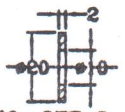
VALVE BODY (ST.) NO. OFF 1



SUPPORT (ST.)



NO. OFF 3
SPLIT PIN (ST.)

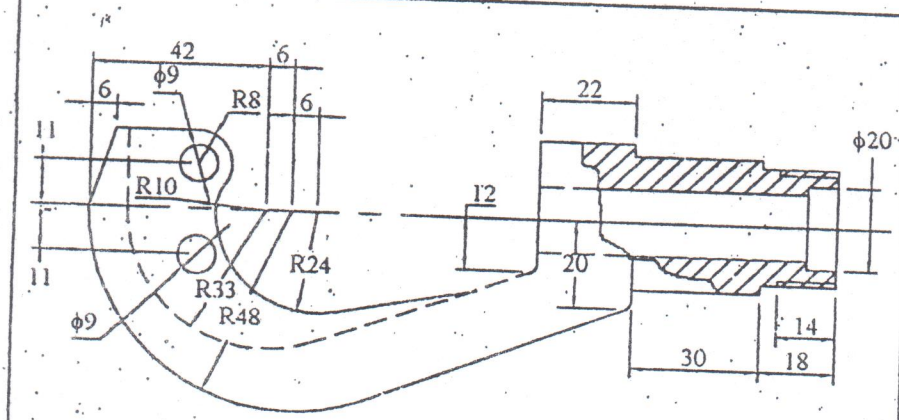


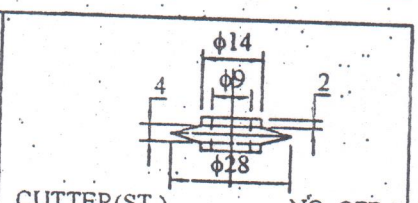
NO. OFF 3
WASHER (ST.)

Given above the details of a LEVER TYPE SAFETY VALVE. Assemble all parts and draw the following: a) SEC. ELEVATION b) H. SEC. SIDE VIEW C) PLAN

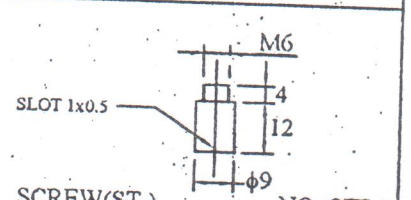
All Dimensions in mms

All unspecified Radii are R3

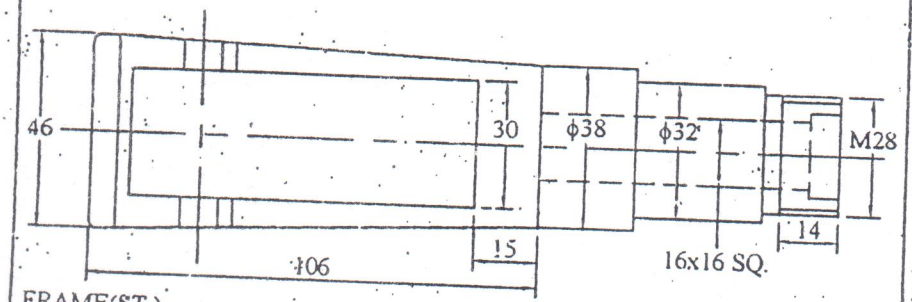




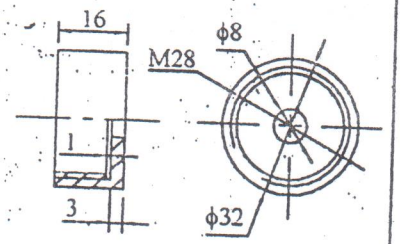
CUTTER(ST.) NO. OFF 1.



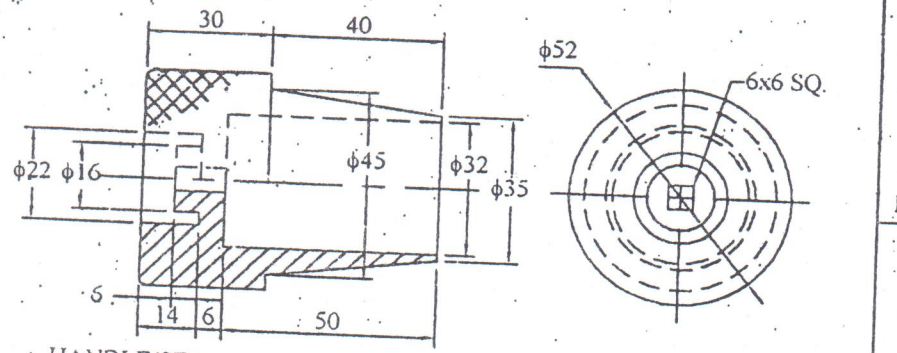
SCREW(ST.) NO. OFF 1



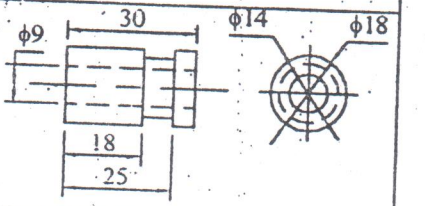
FRAME(ST.) NO. OFF 1



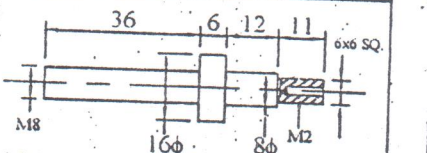
NUT(ST.) NO. OFF 1



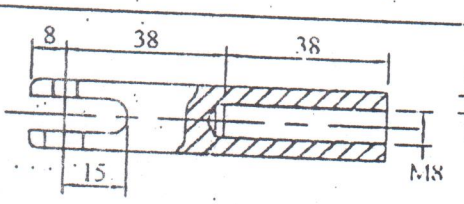
HANDLE(ST.) NO.OFF1



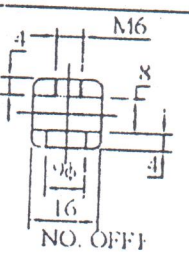
ROLLER(ST.) NO. OFF 2



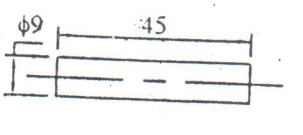
SCREW(ST.) NO. OFF 1



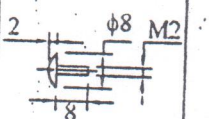
SPINDLE(ST.)



NO. OFF1

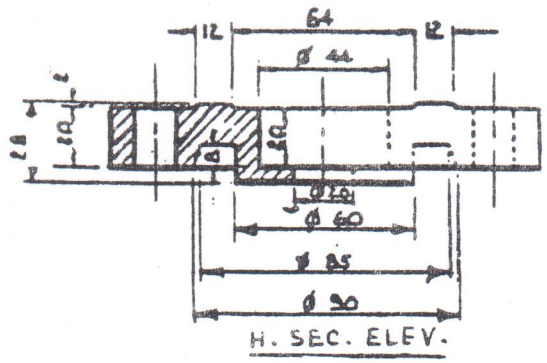


PIN(ST.) NO. OFF2

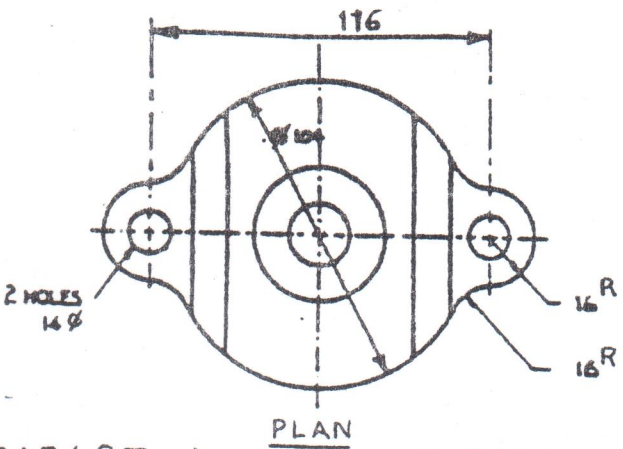


SLOT 1x0.5
CAP SCREW
(ST.) NO. OFF1

You are given the details of a PIPE CUTTER . Assemble all parts and draw the following: a- SEC. ELEV. b- PLAN c- SIDE VIEW
All dimensions in mm and all unspecified radii are R2.

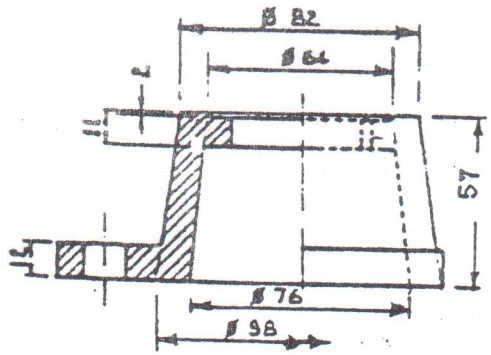


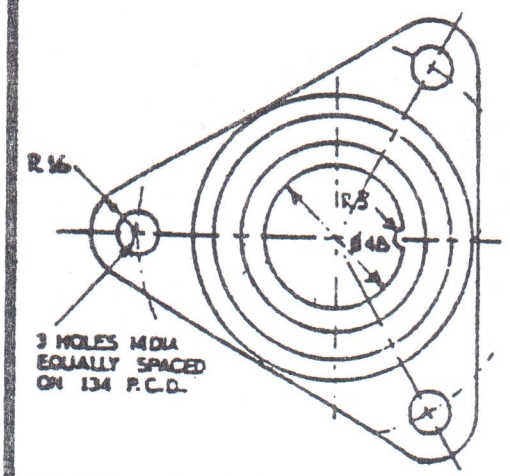
H. SEC. ELEV.



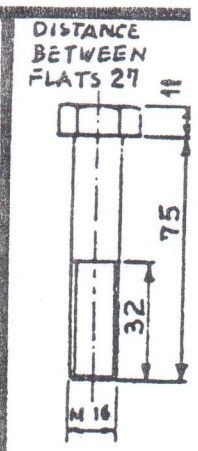
PLAN

CAP (ST.) NO. OFF 1

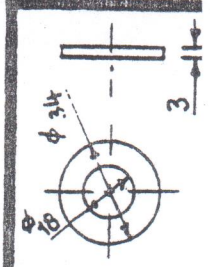




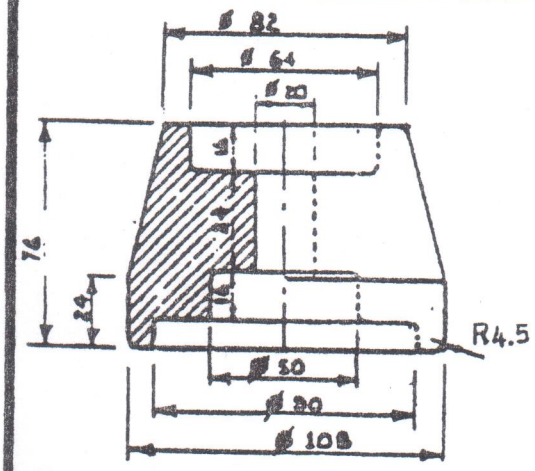
BASE (ST.) NO. OFF 1



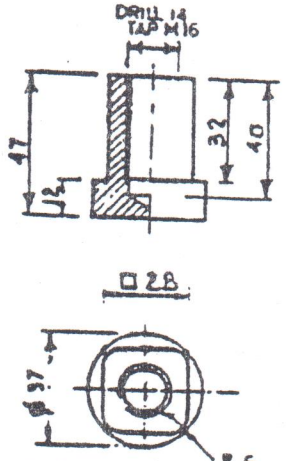
BOLT (HEX. H
(ST.) NO.OF



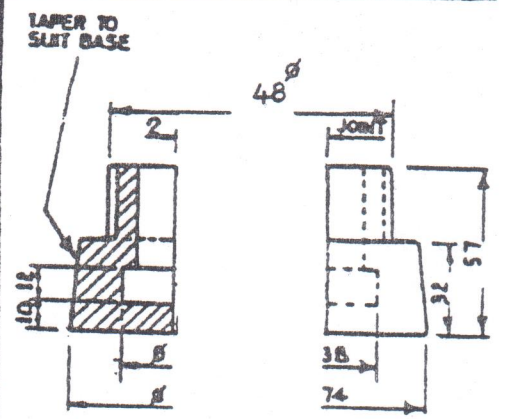
WASHER
(ST.) NO.OFF

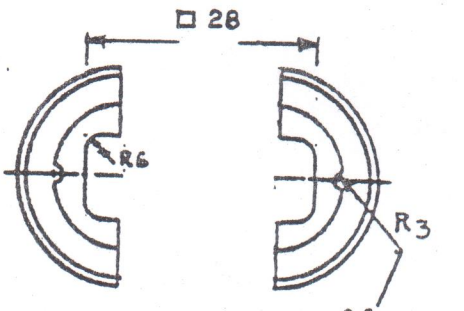


INSULATOR (PORCELAIN) NO. OFF 1



NUT (ST.) NO.OFF 1.





INSULATING BUSH (PORCELAIN)
'MADE IN HALVES' NO. OFF 1

You are given the details of a THIRD RAIL INSULATOR.

Assemble all parts and draw to full size the following:

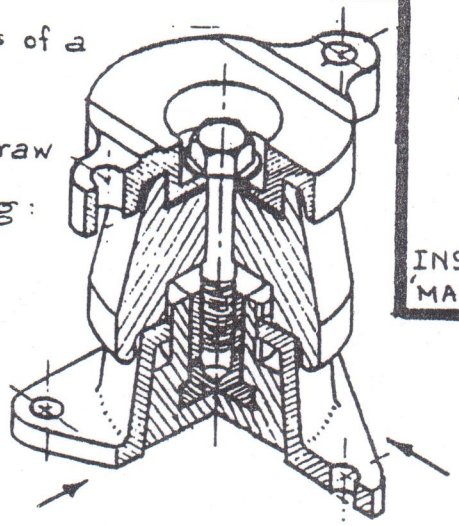
1_ SEC. ELEV.

2_ H. SEC. SIDE VIEW

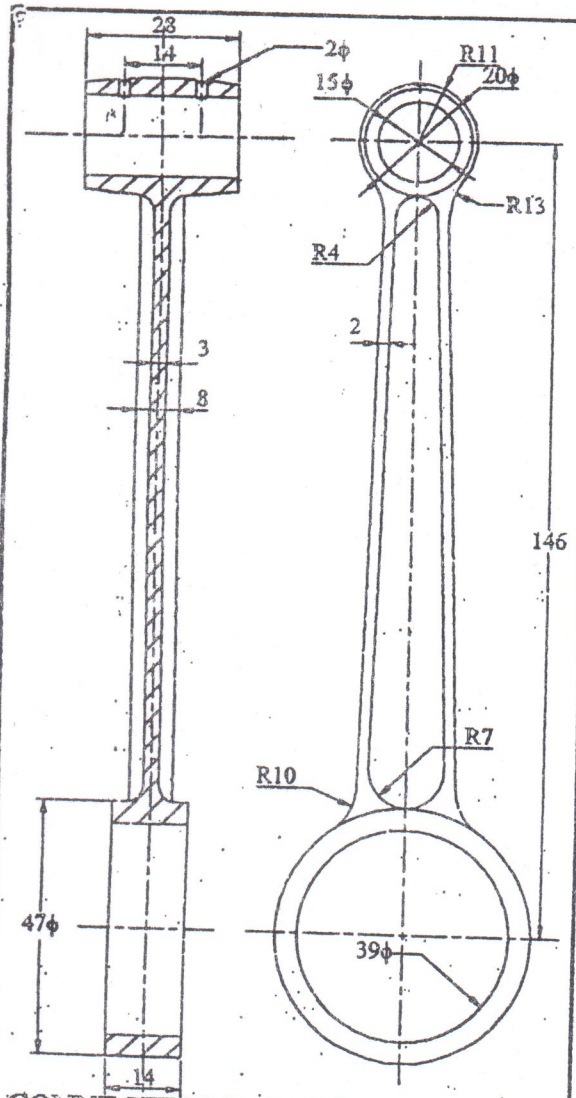
3_ PLAN

All dims. in mm

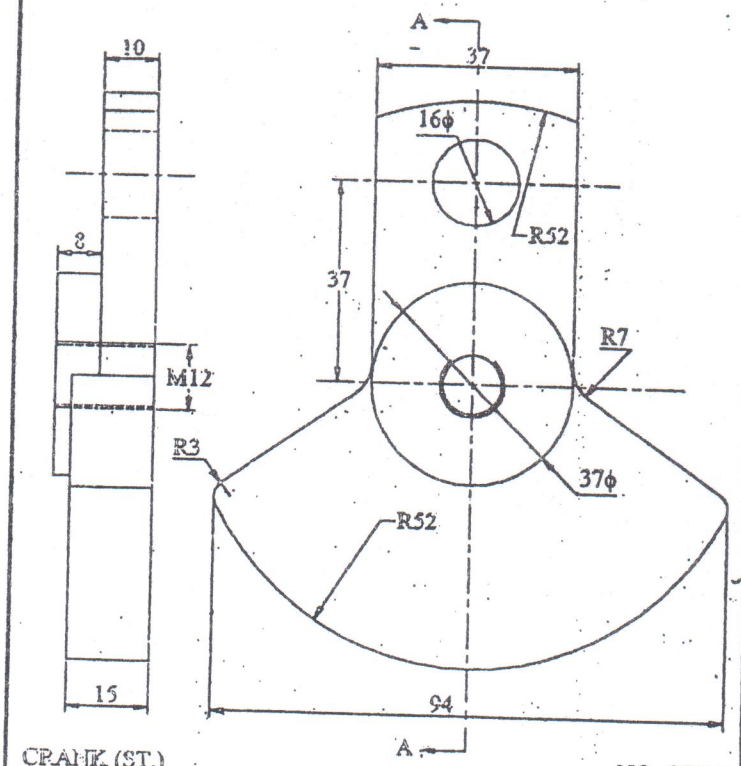
All unspecified radii 2R



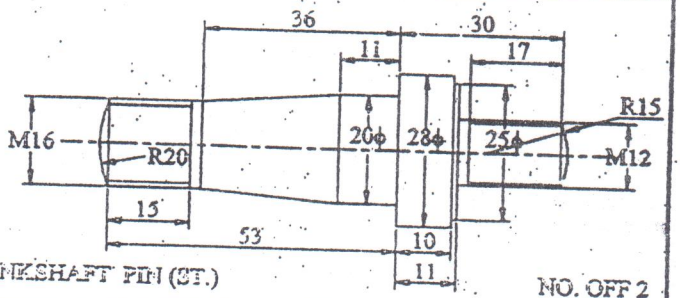
KEY TO ASSEMBLY



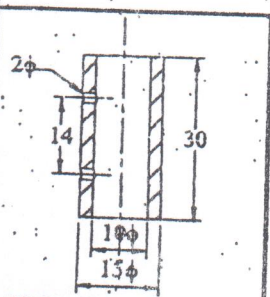
CONNECTING ROD (ST.) NO. OFF 1



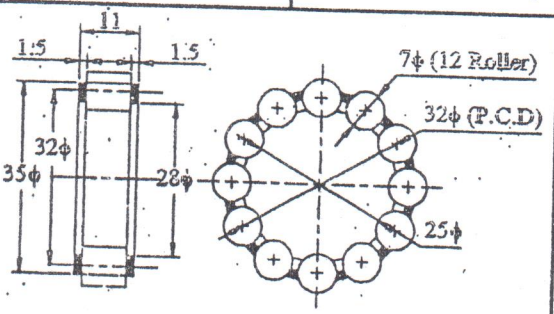
CRANK (ST.) NO. OFF 2



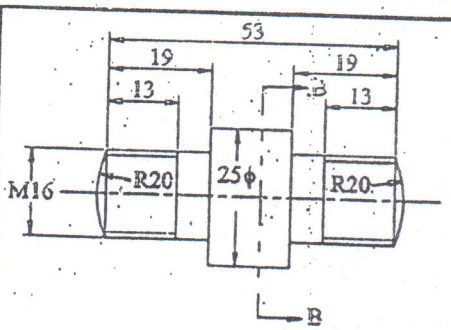
CRANKSHAFT PIN (ST.) NO. OFF 2



BUSH (BRZ.)
NO. OFF 1

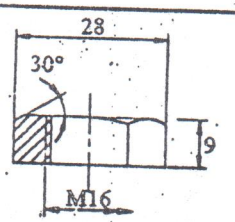


ROLLER BEARING (ST.) NO. OFF 1

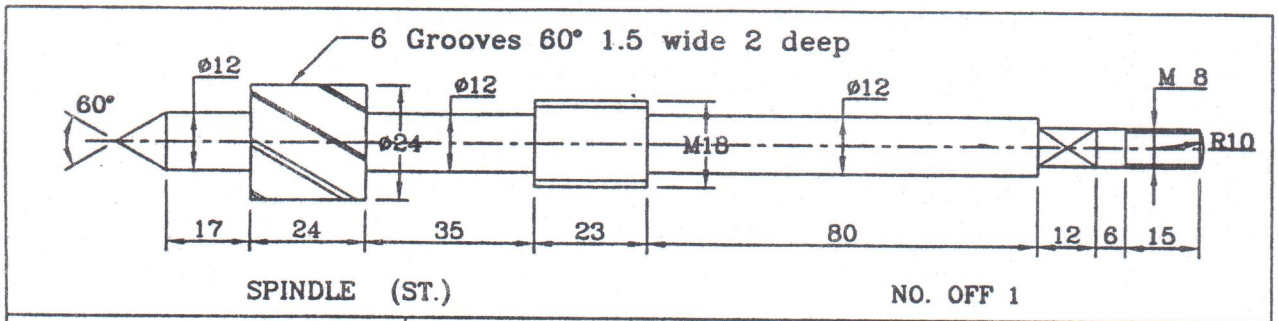


CON. ROD PIN (ST.) NO. OFF 1

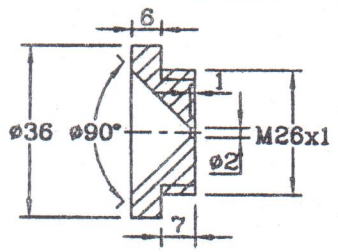
Given above the details of a CRANKSHAFT AND CONNECTING ROD ASSEMBLY. Assemble all parts and draw the following:
1- SEC. ELEV. (A-A) 2- SEC. SIDE VIEW (B-B)
All dimensions are in mm.



NUT (ST.) NO. OFF 2

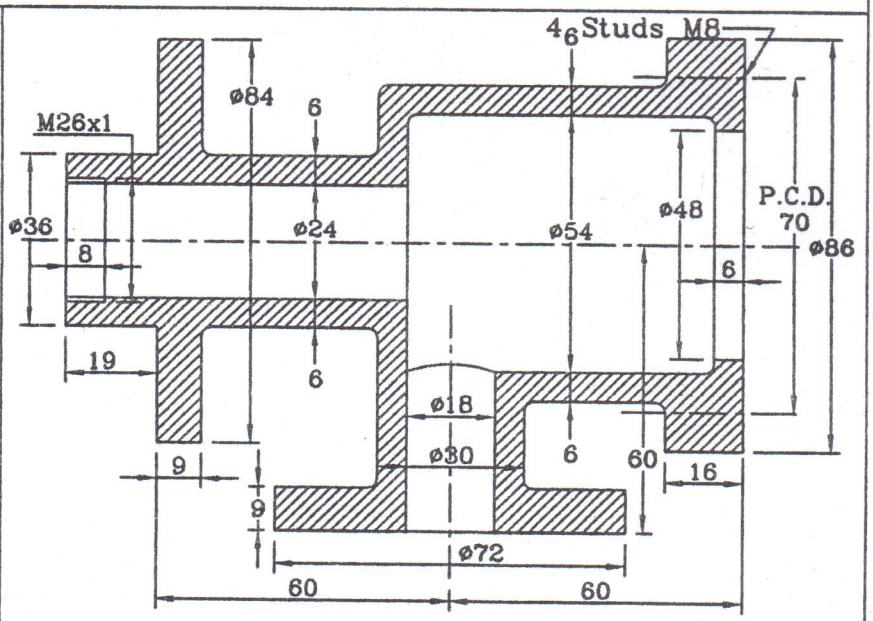


SPINDLE (ST.) NO. OFF 1



NOZZLE (ST.)

NO. OFF 1



BODY (BRZ.) NO. OFF 1

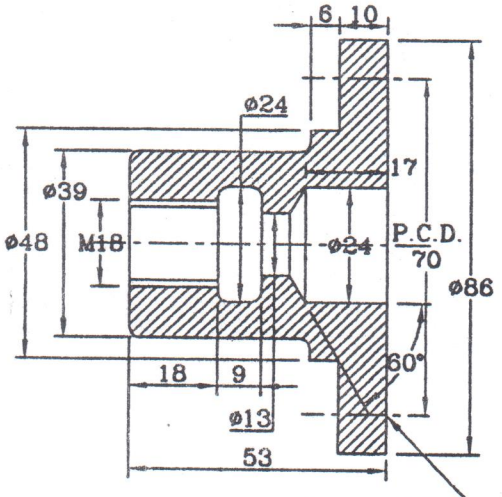
washer for M8 screw

WASHER (ST.)

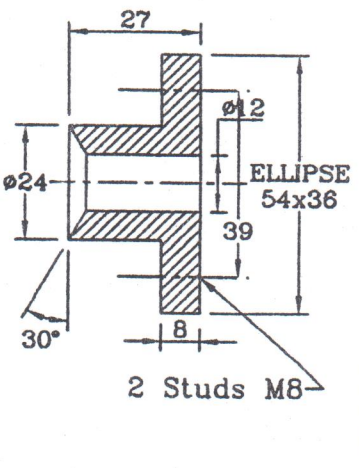
NO. OFF 1

NUT (ST.)

NO. OFF 1

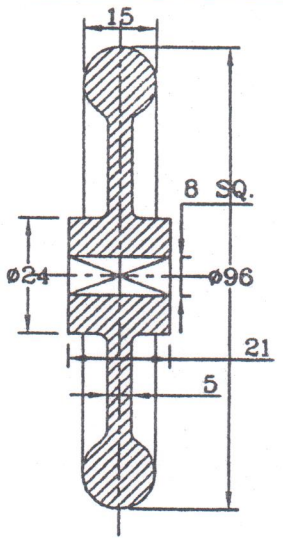


COVER (BRZ.) NO. OFF 1



GLAND (BRZ.)

NO. OFF 1

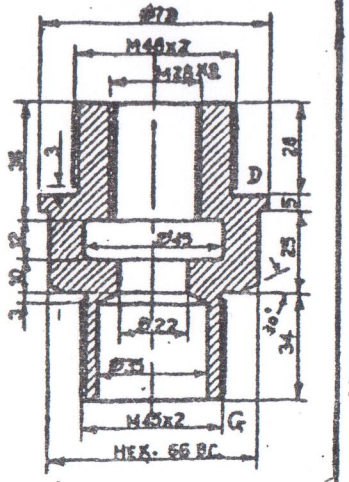


HANDWHEEL (BRZ.)

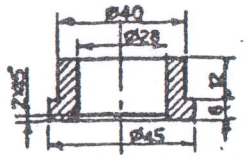
NO. OFF 1

You are given the details of an OIL BURNER. Assemble all parts and draw the following: a) SEC. ELEVATION b) SIDE VIEW c) PLAN

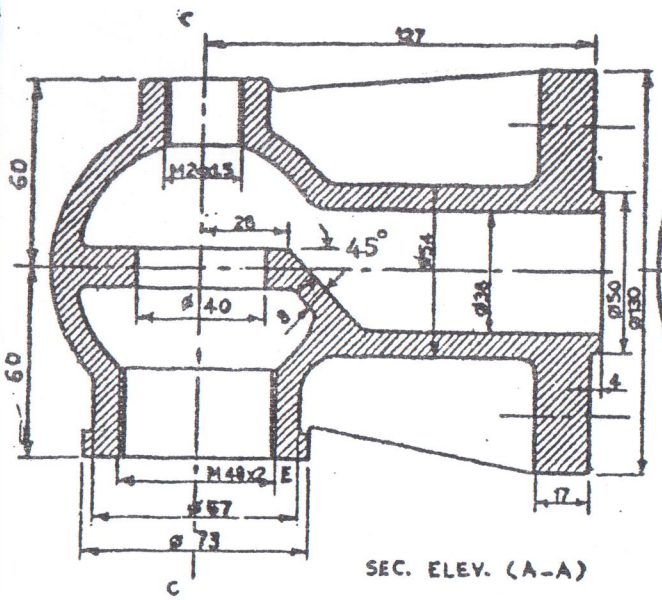
All Dimensions in mms All unspecified Radii are R2



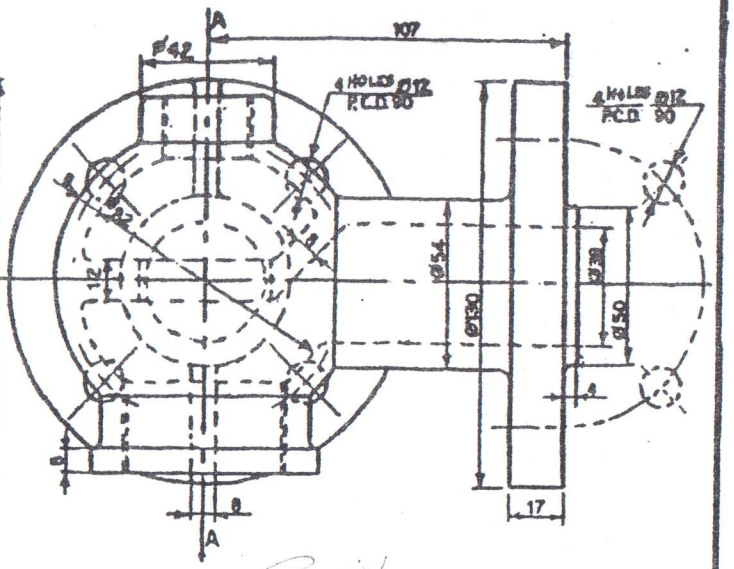
STUFFING BOX (BRZ.) NO. OFF 1



VALVE SEAT (BRZ.) NO. OFF 1



SEC. ELEV. (A-A)



VALVE BODY (C.I) NO. OFF 1

You are given the details of a STOP VALVE .

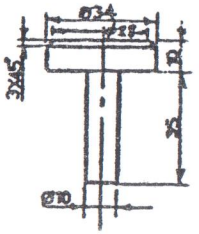
Assemble all parts and draw to full size the following views :

1) SEC. ELEV. (A - A)

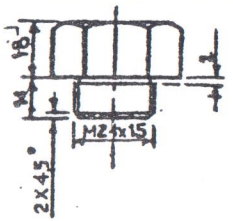
2) H. SEC. SIDE VIEW (C - C)

3) PLAN

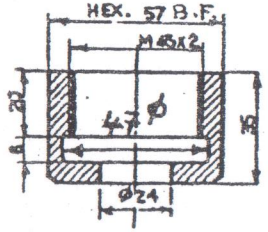
All dimensions in mm , and all unspecified radii R2 .



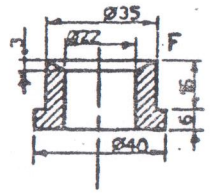
VALVE (ST.) NO. OFF 1



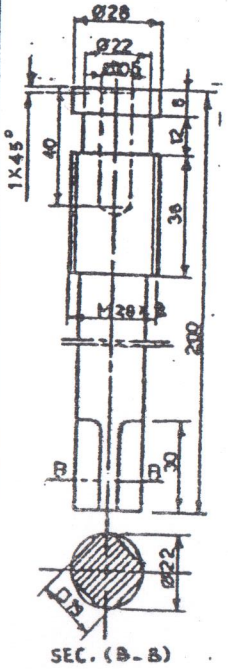
PLUG (ST.) NO. OFF 1



NUT (BRZ.) NO. OFF 1

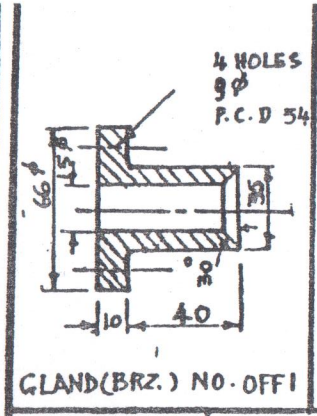


GLAND (BRZ.) NO. OFF 1

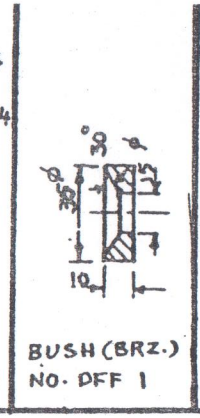


SEC. (B-B)

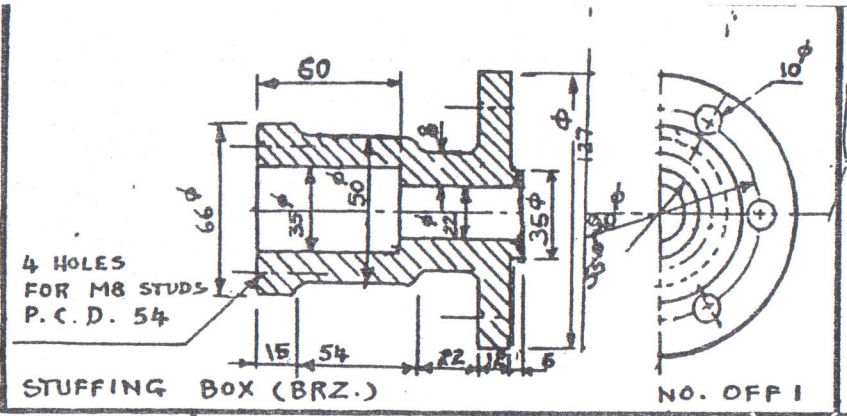
SPINDLE (ST.) NO. OFF 1



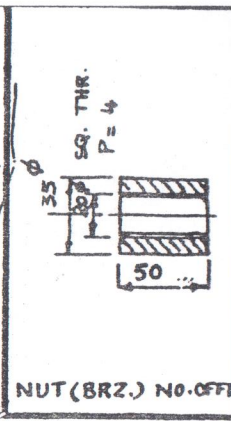
GLAND (BRZ.) NO. OFF 1



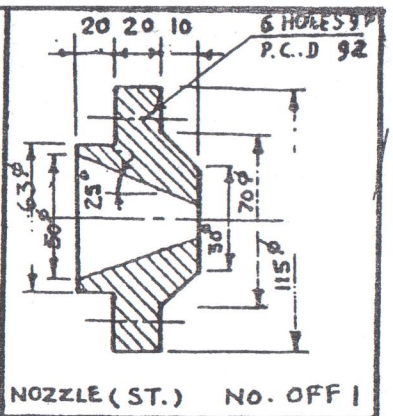
BUSH (BRZ.)
NO. OFF 1



STUFFING BOX (BRZ.) NO. OFF 1

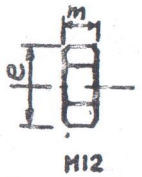


NUT (BRZ.) NO. OFF 1



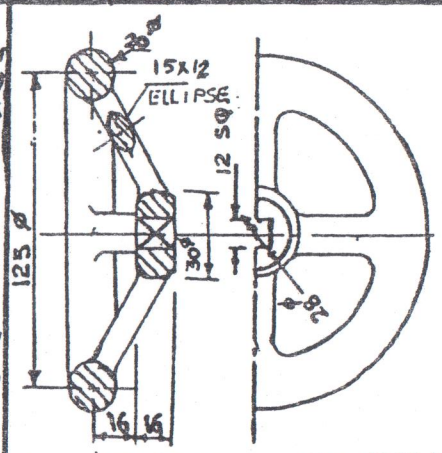
NOZZLE (ST.) NO. OFF 1

M8
e 15 MM
m 6.5 MM
NUT (ST.) NO. OFF 16

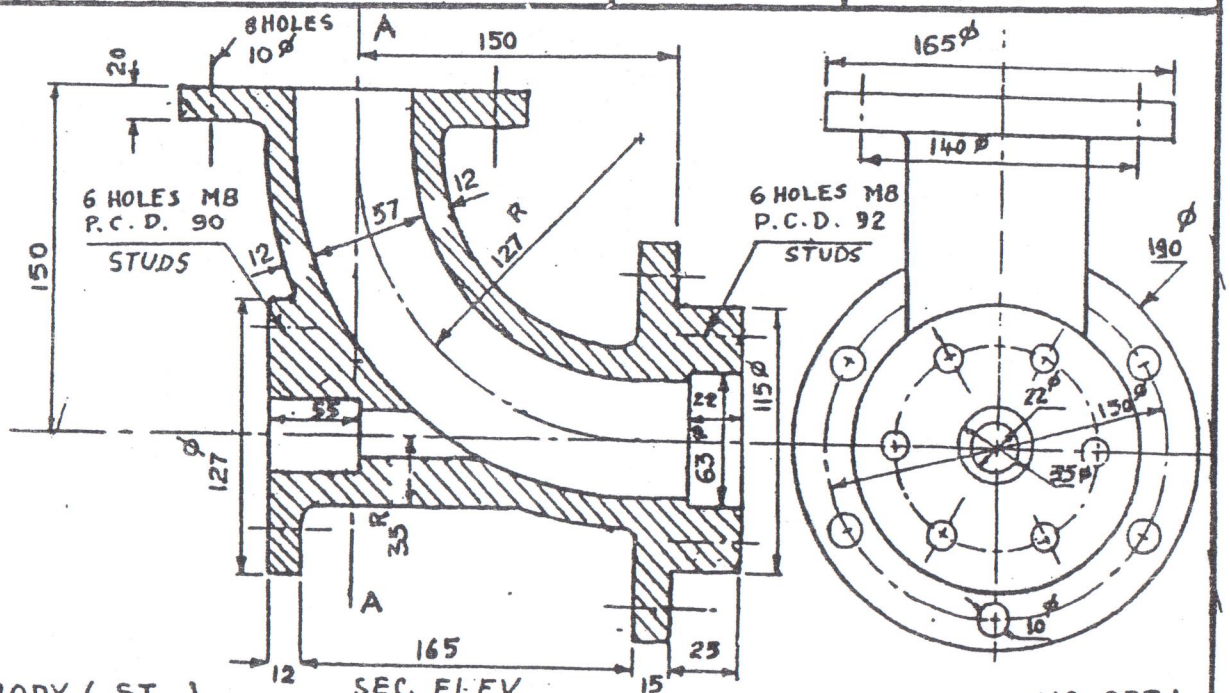


M12
e 22 MM
m 10 MM

NUT (ST.) NO. OFF 1



HANDWHEEL (C.I) NO. OFF 1

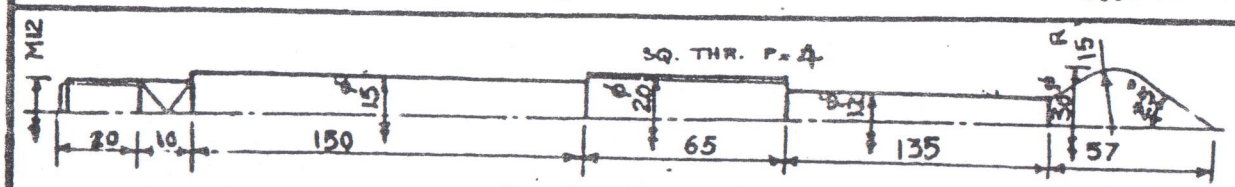


BODY (ST.) SEC. ELEV. NO. OFF 1

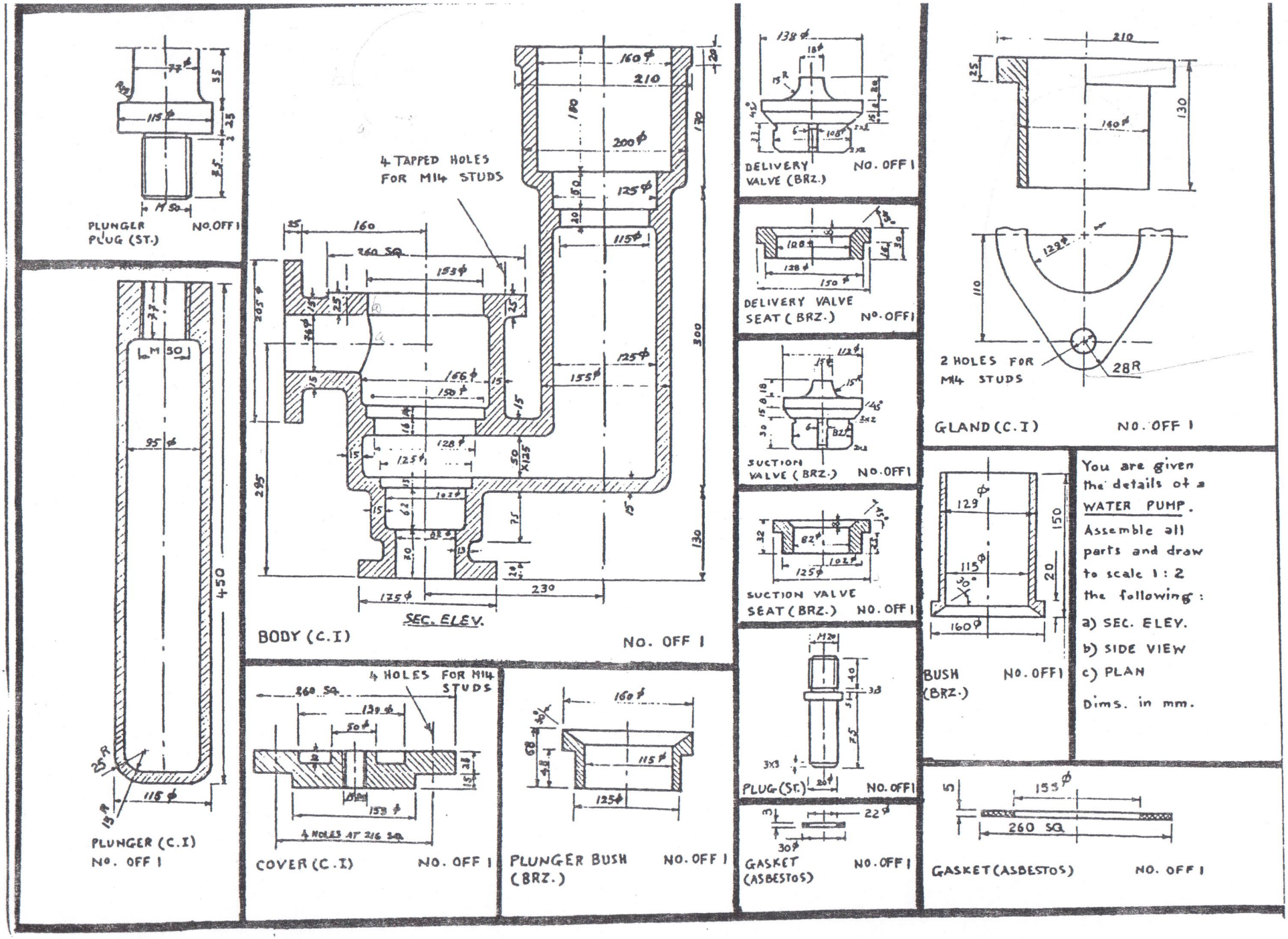
You are given the details of a SPEAR VALVE. Assemble all parts and draw to scale 1:2 the following: (TIME: 4 hours)

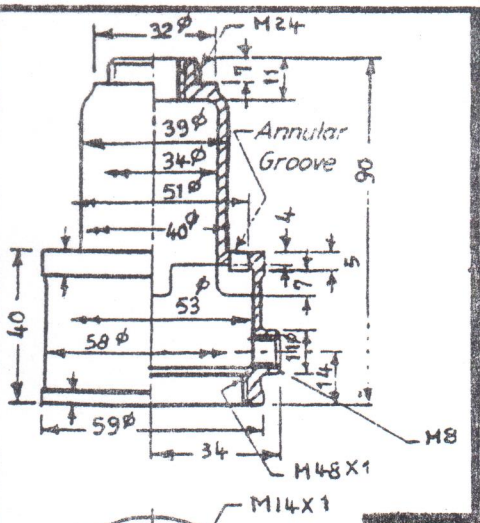
1- SEC. ELEV.
2- H. SEC. SIDE VIEW (A-A)
2- H. SEC. PLAN

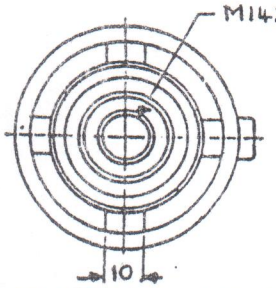
DIMS. IN MM.
All unspecified radii are R3.



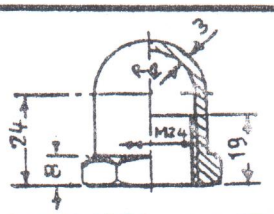
SPEAR (ST.) H. ELEV. NO. OFF 1


PLUNGER PLUG (ST.) NO. OFF 1
PLUNGER (C.I) NO. OFF 1
4 TAPPED HOLES FOR M14 STUDS
BODY (C.I) NO. OFF 1
SEC. ELEV.
4 HOLES FOR M14 STUDS
COVER (C.I) NO. OFF 1
PLUNGER BUSH (BRZ.) NO. OFF 1
DELIVERY VALVE (BRZ.) NO. OFF 1
DELIVERY VALVE SEAT (BRZ.) NO. OFF 1
SUCTION VALVE (BRZ.) NO. OFF 1
SUCTION VALVE SEAT (BRZ.) NO. OFF 1
PLUG (ST.) NO. OFF 1
GASKET (ASBESTOS) NO. OFF 1
2 HOLES FOR M14 STUDS
GLAND (C.I) NO. OFF 1
BUSH (BRZ.) NO. OFF 1
GASKET (ASBESTOS) NO. OFF 1
You are given the details of a WATER PUMP.
Assemble all parts and draw to scale 1 : 2 the following :
a) SEC. ELEV.
b) SIDE VIEW
c) PLAN
Dims. in mm.

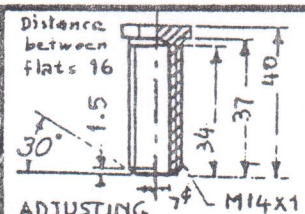




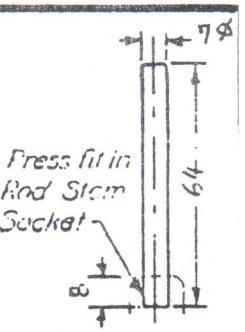
BODY (BR.) NO. OFF 1



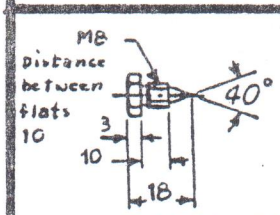
COVER (BR.) NO. OFF 1



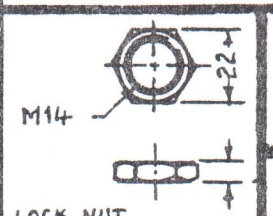
ADJUSTING SCREW (BR.) NO. OFF 1



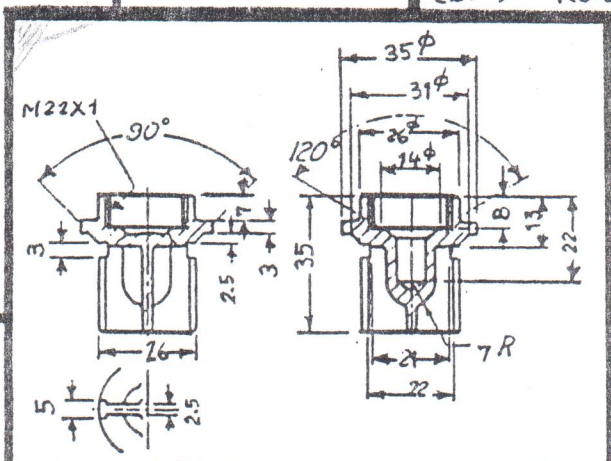
ROD STEM (ST.)



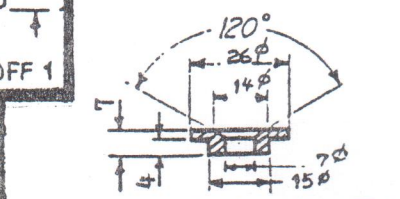
LOCK SCREW (BR.) NO. OFF 1



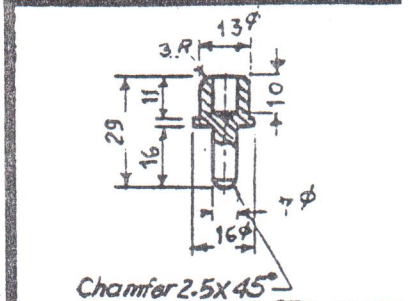
LOCK NUT (BR.) NO. OFF 1



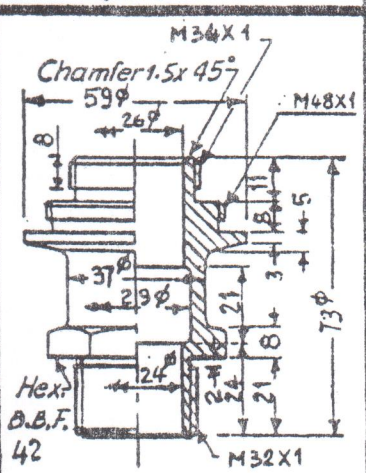
VALVE (BR.) NO. OFF 1



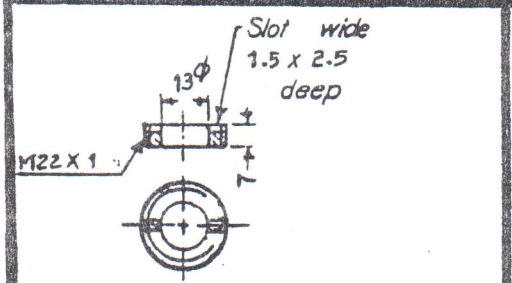
SPRING SEAT (ST.) NO. OFF 1



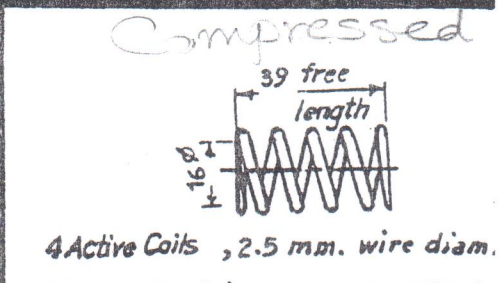
ROD STEM SOCKET (ST.) NO. OFF



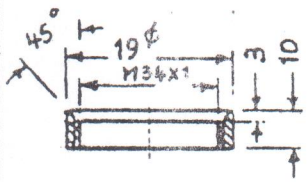
BASE (BR.) NO. OFF 1



RETAINING RING (BR.) NO. OFF 1



SPRING (ST.) NO. OFF 1



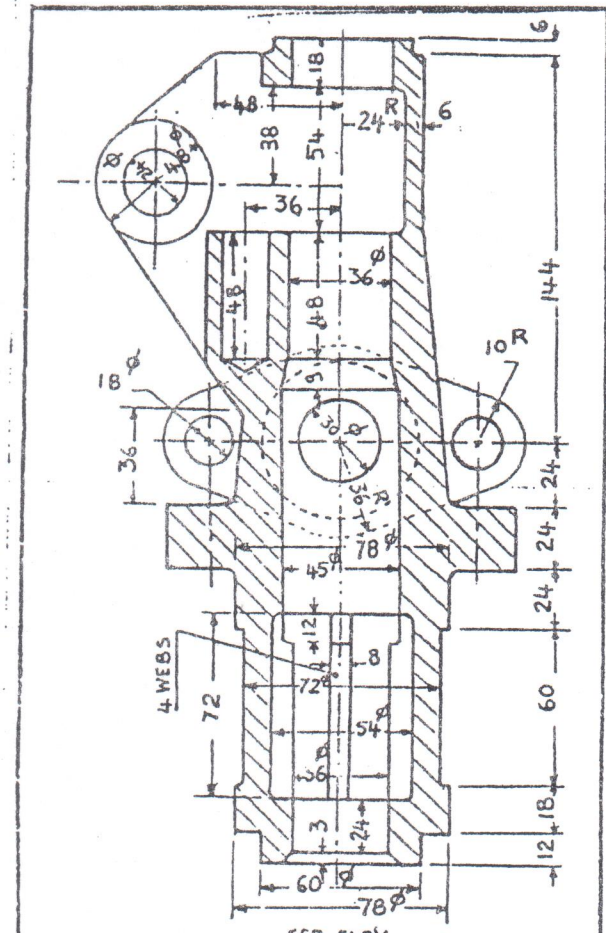
REGULATING RING (BR.) NO. OFF 1

You are given the details of a RELIEF VALVE. Assemble all parts with the spring compressed 5 mm and draw to scale 2:1 the following views:

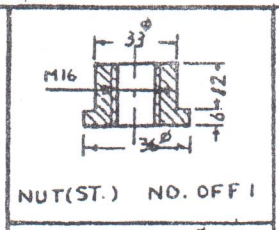
1. H. SEC. ELEVATION
2. PLAN

All dimensions in mm

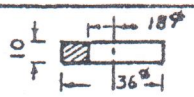
All unspecified radii are 2R.



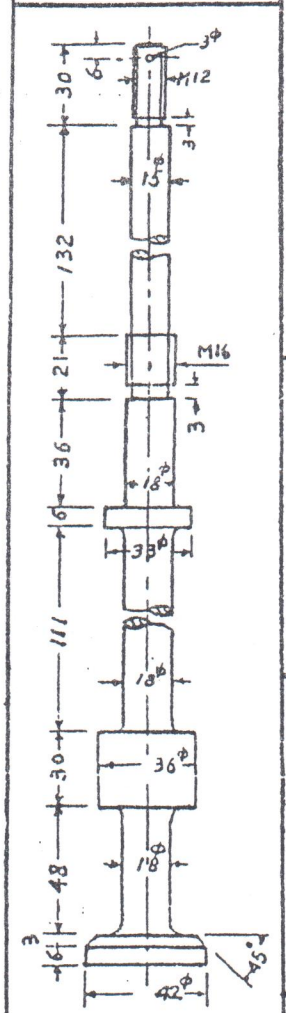
BODY (C.I) NO. OFF 1



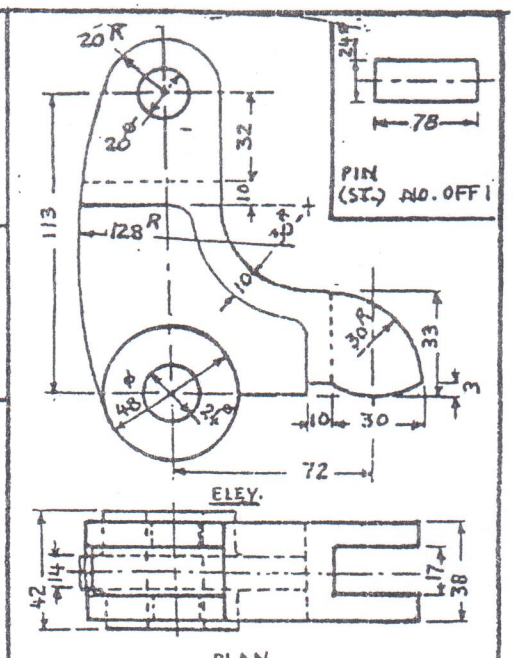
NUT(ST.) NO. OFF 1



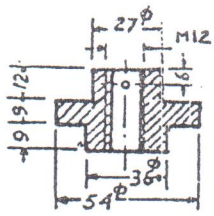
DISC(ST.) NO. OFF 4



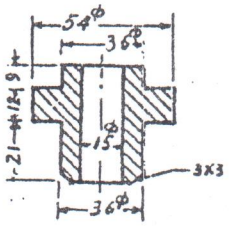
VALVE (ST.) NO. OFF 1



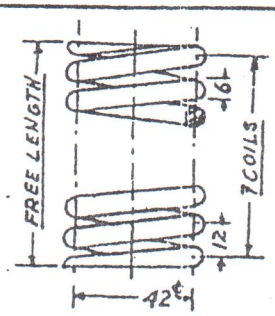
ROCKER (ST.) NO. OFF 1



SPRING UPPER SEAT (ST.) NO. OFF 1



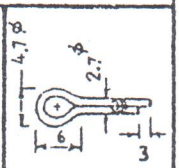
SPRING LOWER SEAT (ST.) NO. OFF 1



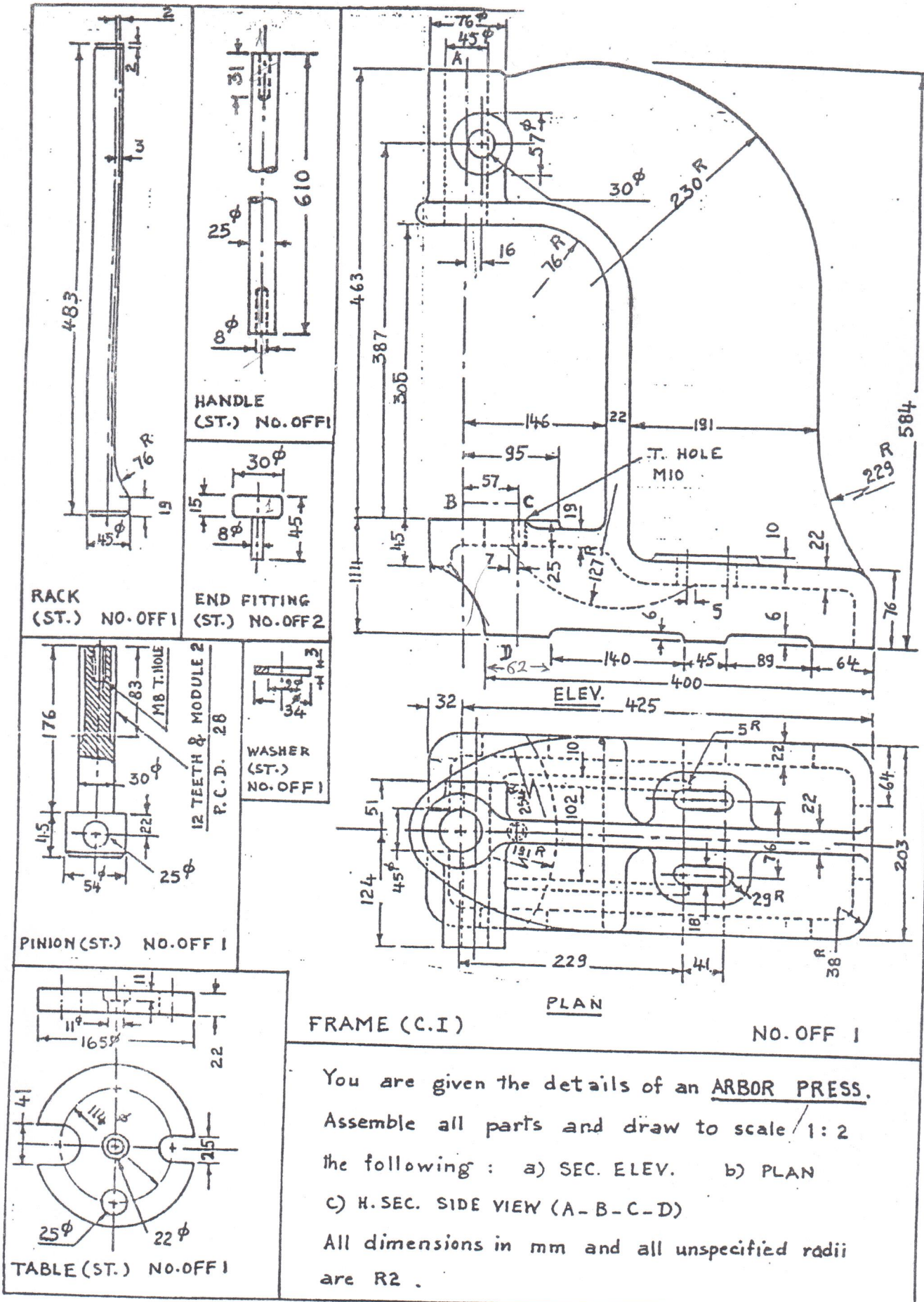
SPRING (ST.) NO. OFF 1

Given above the details of an AIR VALVE. Assemble all parts and draw to full size the following: a) SEC. ELEV. b) SIDE VIEW.

All dimensions in mm.
All unspecified radii are R2.

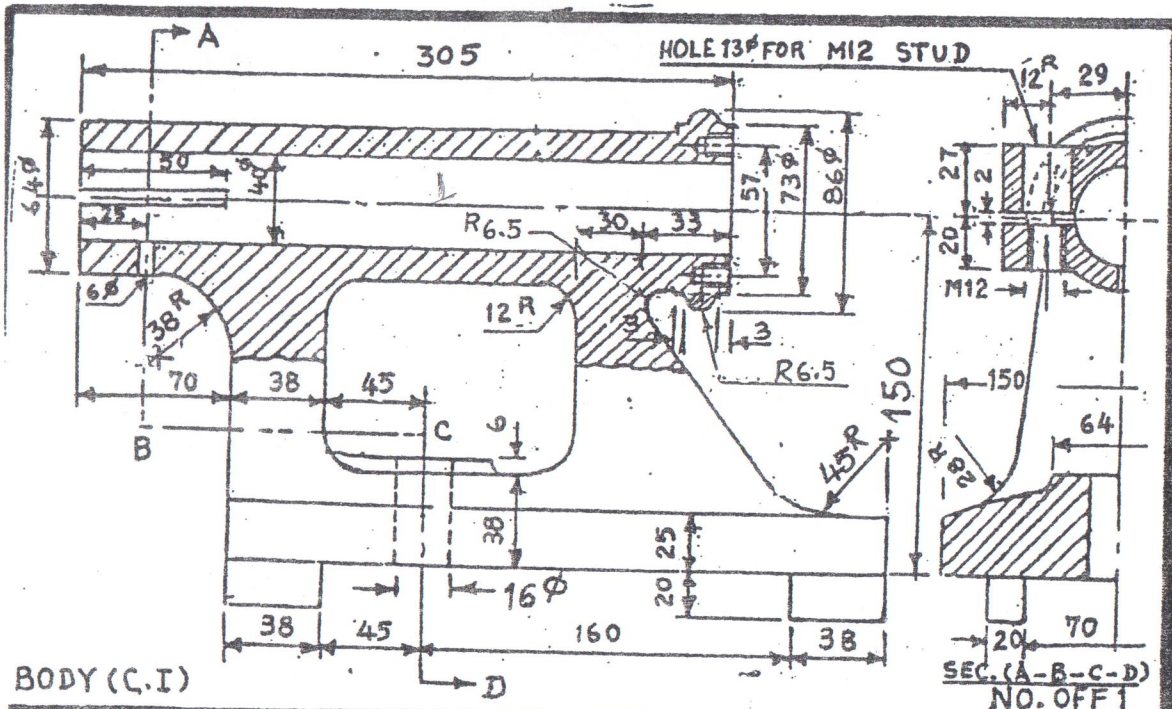


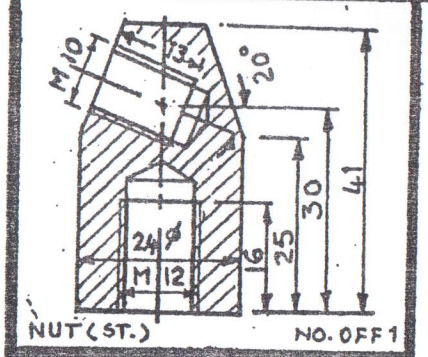
SPLIT PIN (ST.) NO. OFF 1

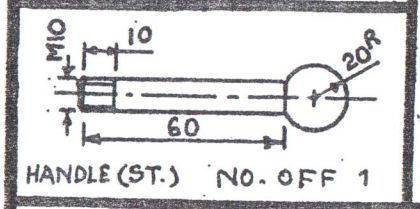


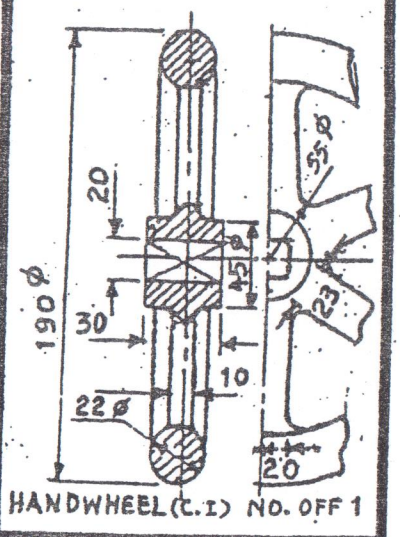
You are given the details of an ARBOR PRESS. Assemble all parts and draw to scale 1 : 2 the following : a) SEC. ELEV. b) PLAN c) H. SEC. SIDE VIEW (A–B–C–D)

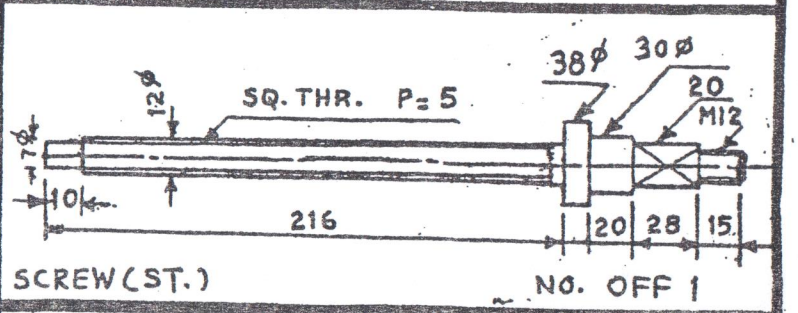
All dimensions in mm and all unspecified radii are R2 .

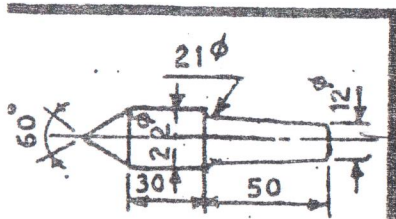


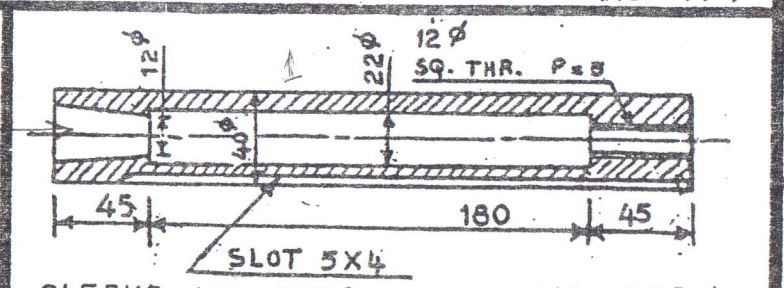


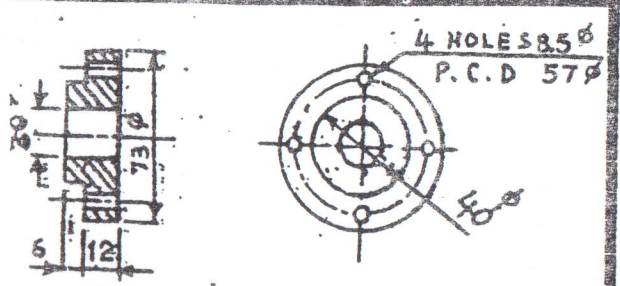


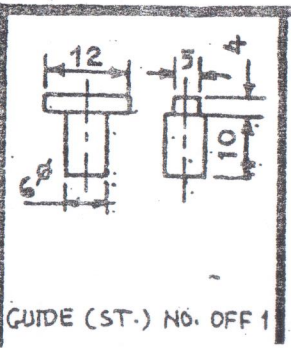


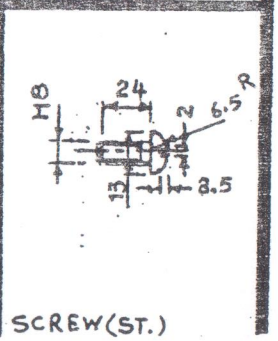












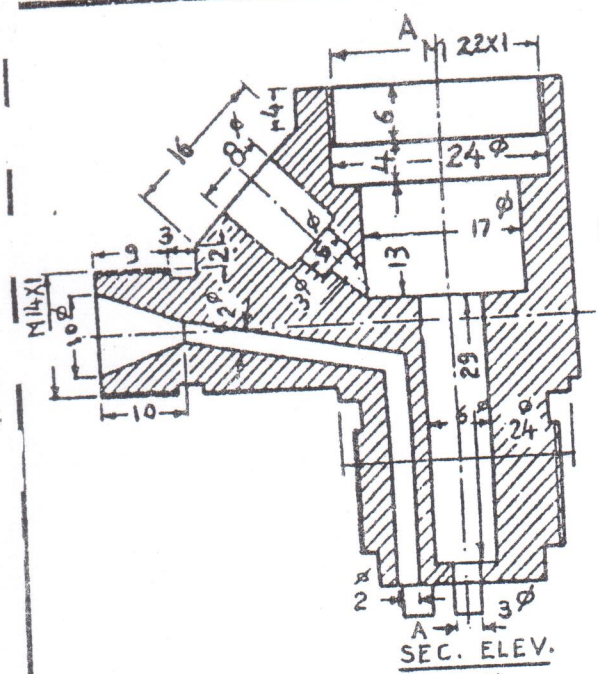
The details of a TAIL STOCK -2 are given above. Assemble all parts and draw to scale 1:2 with the centre in its inner position the following views:

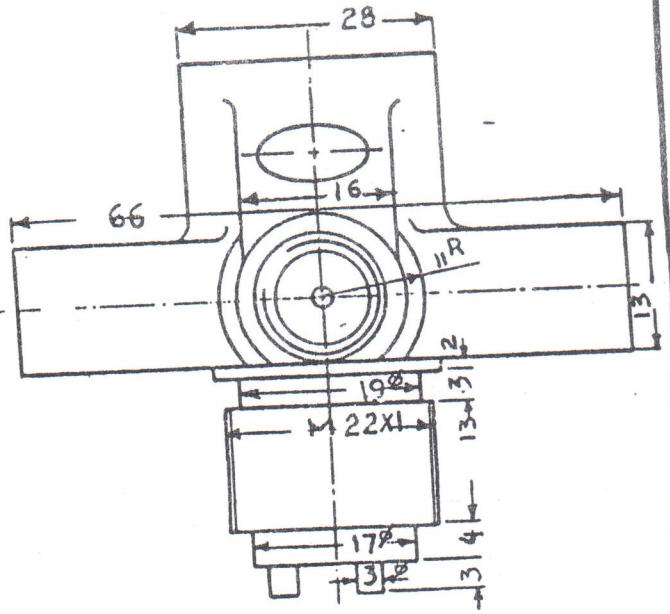
1-SEC. ELEV.

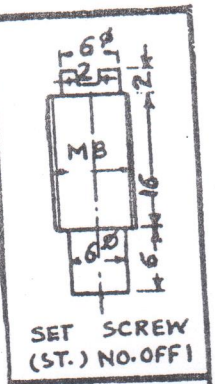
2-PLAN

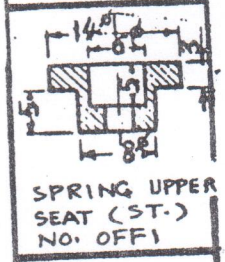
3-H. SEC. SIDE VIEW (A-B-C-D)

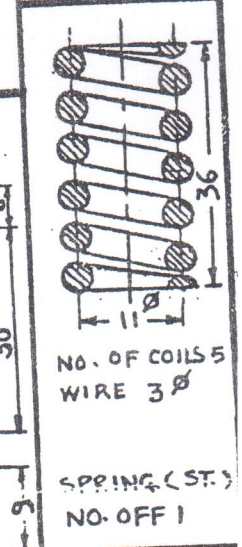
All dimensions in mm and all unspecified radii are R2

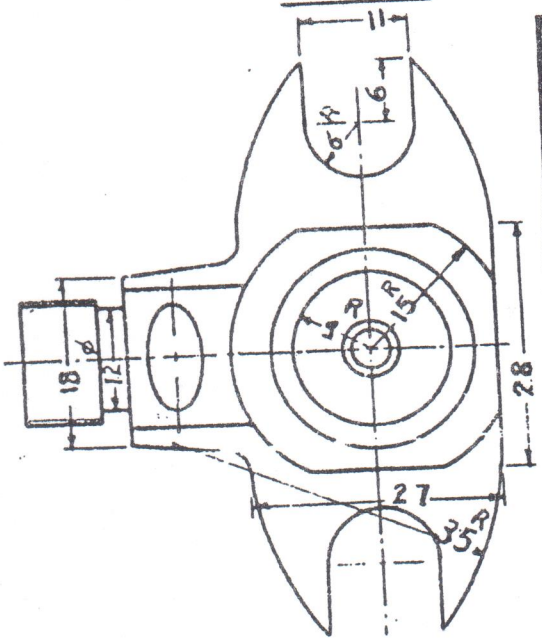


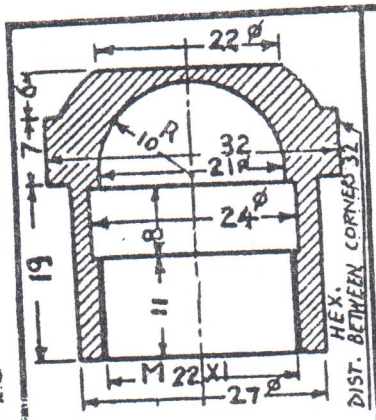


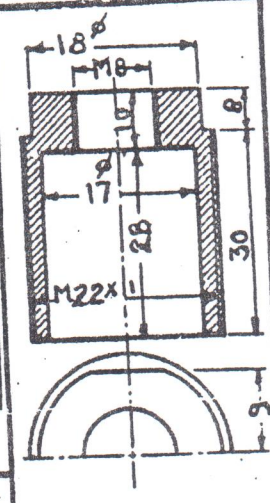


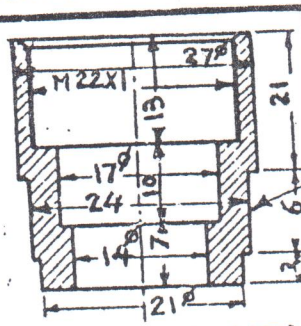


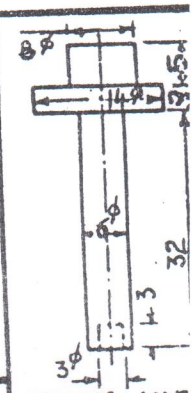


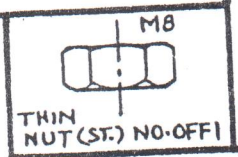


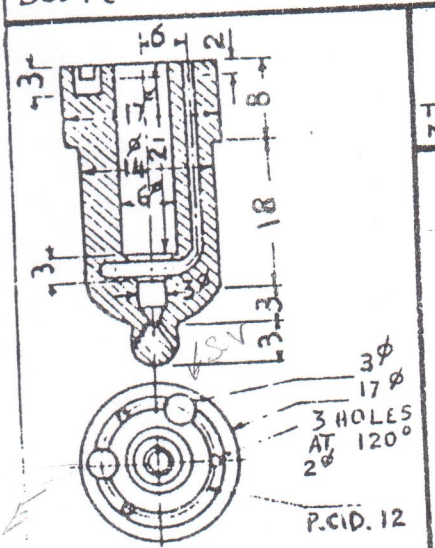








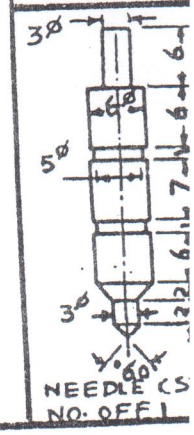


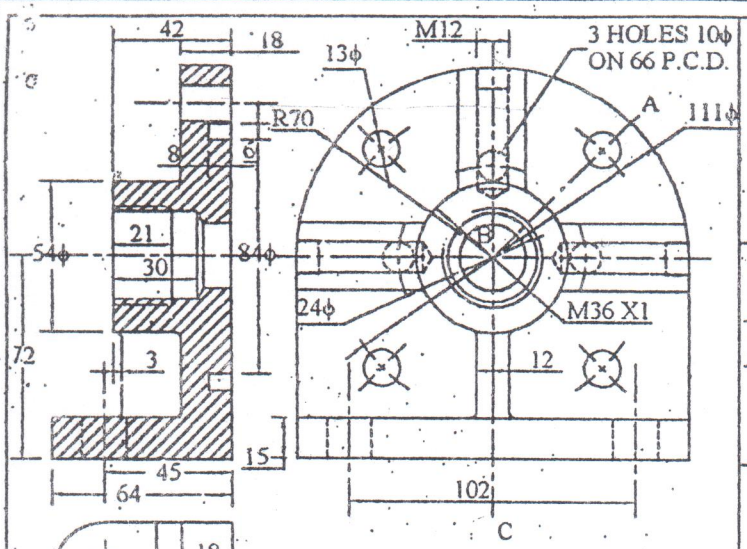


You are given the details of a FUEL INJECTOR. Assemble all parts and draw to scale 2:1 the following:

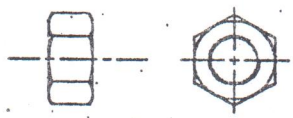
1. SEC. ELEV. 2. H. SEC. SIDE VIEW (A-A)
3. PLAN.

Dimensions in MM and all unspecified radii are R3.

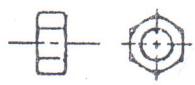




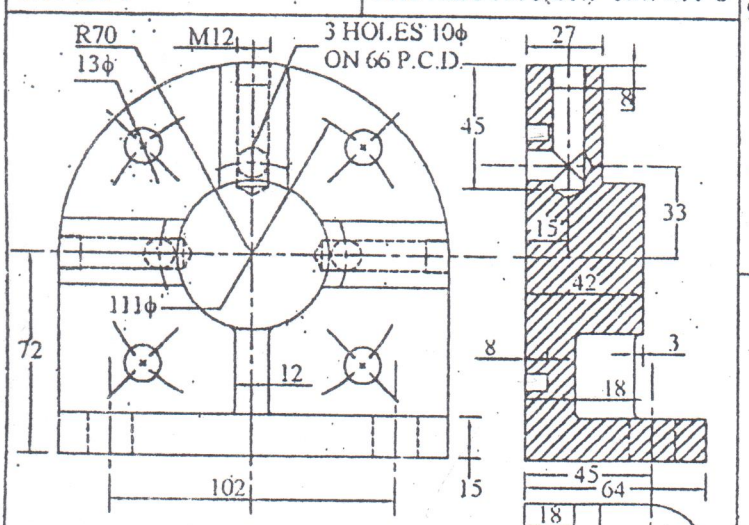
CYLINDER FRONT HEAD(C.I)
NO. OFF 1



M18 HEX. NUT(ST.) NO. OFF 1

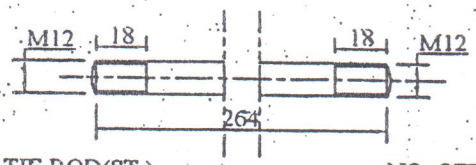


M12 HEX. NUT(ST.) NO. OFF 8

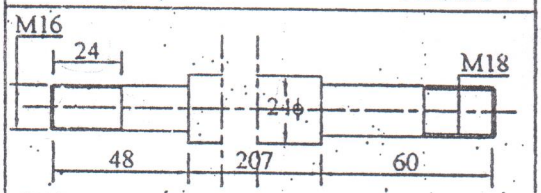


CYLINDER REAR HEAD(C.I)
NO. OFF 1

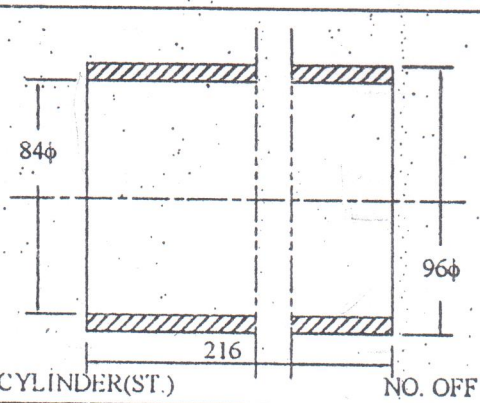
You are given the details of an AIR CYLINDER. Assemble all parts and draw the following:
1- SEC. ELEV. (A-B-C)
2- H. SEC. PLAN
3- SIDE VIEW
All dimensions in mm. and all unspecified radii are R2.



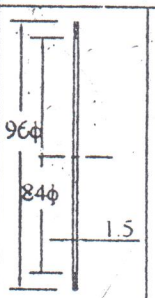
TIE ROD(ST.) NO. OFF 4



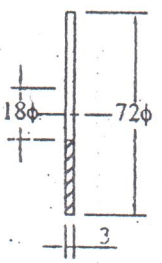
PISTON ROD(ST.) NO. OFF 1



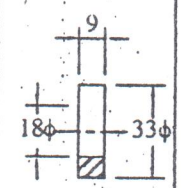
CYLINDER(ST.) NO. OFF 1



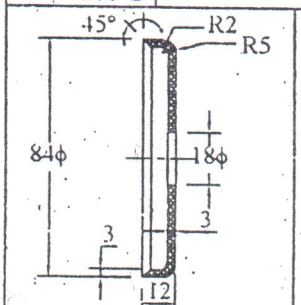
GASKET (RUBBER) NO. OFF 2



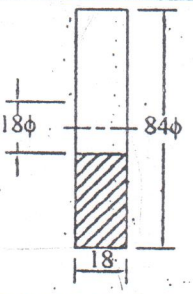
RETAINER (ST.) NO. OFF 2



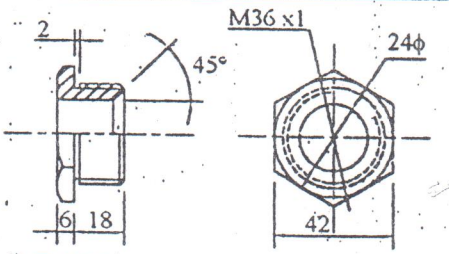
WASHER (ST.) NO. OFF 1



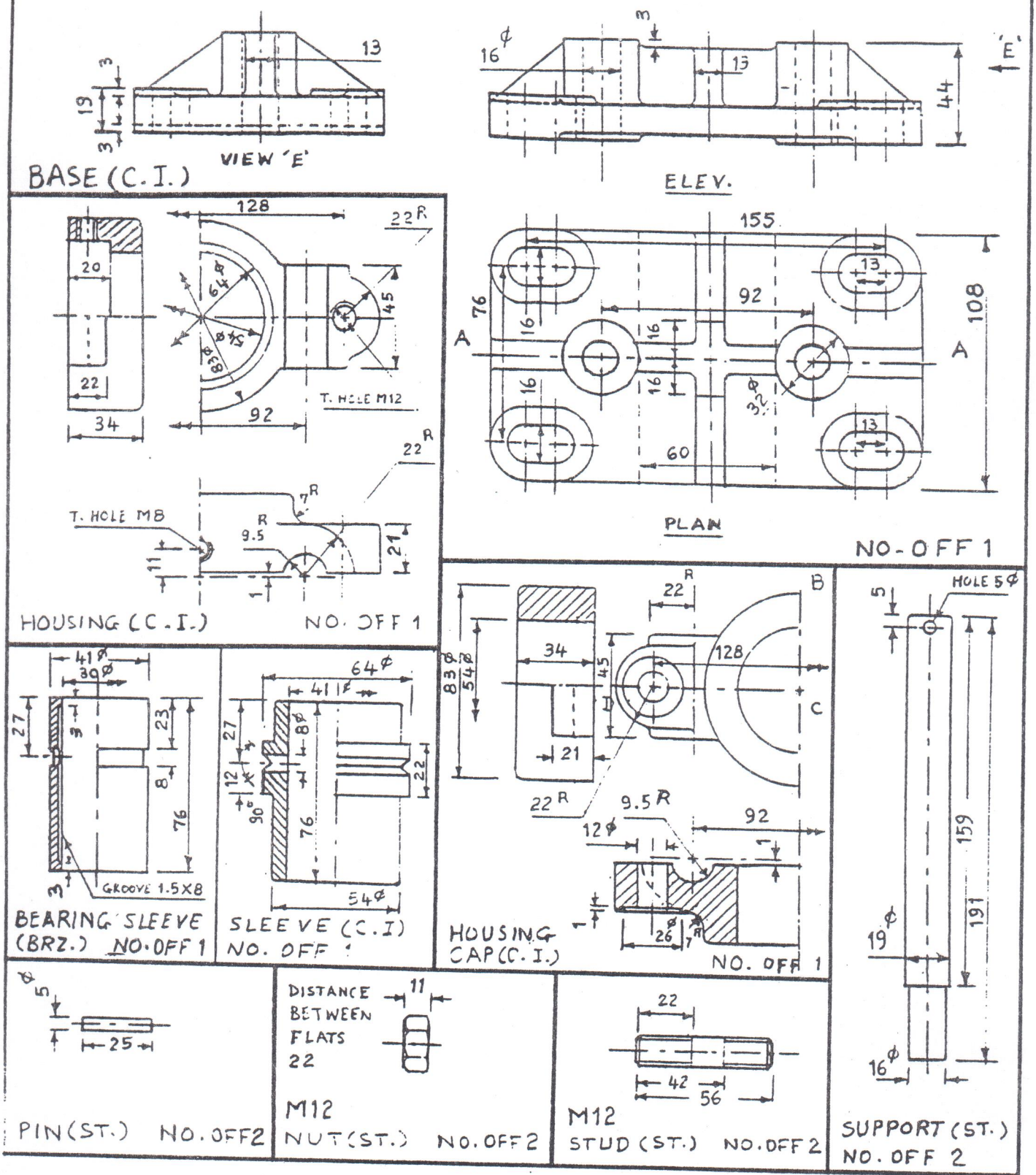
'L' CUP RING (RUBBER) NO. OFF 2



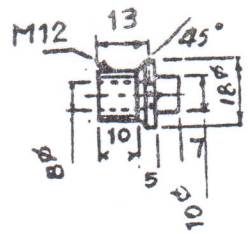
PISTON (C.I) NO. OFF 1



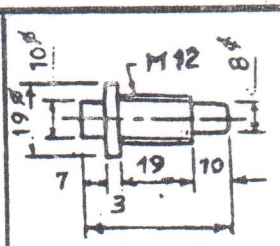
GLAND(BRZ.) NO. OFF 1



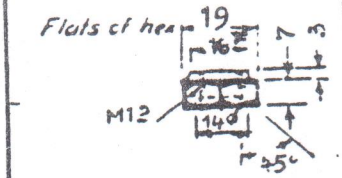
The details of an ADJUSTABLE MID BEARING are given above. Assemble all parts with bearing centre 120 mm from bottom surface of the base. Draw to full size the following:
1- H. SEC. ELEV. (A-A) 2- SEC. SIDE VIEW (B-C-D) 3- PLAN
All dims in mm and all unspecified radii are 2R.



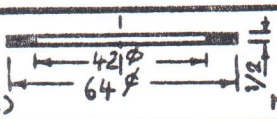
PIN BEARING (BRZ.) NO. OFF 1



VALVE STOP (BRZ) NO.OFF 1

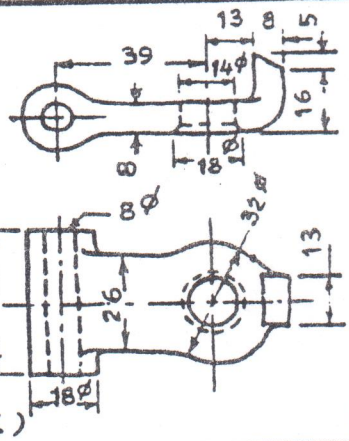


VALVE NUT (BRZ) NO.OFF 1

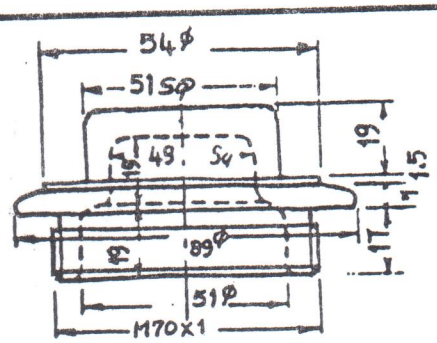


SEAL (RUBBER) NO. OFF 1

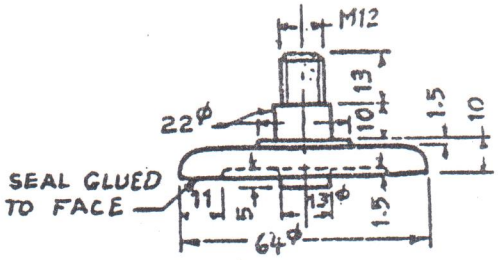
VALVE PIN (ST.) NO. OFF 1



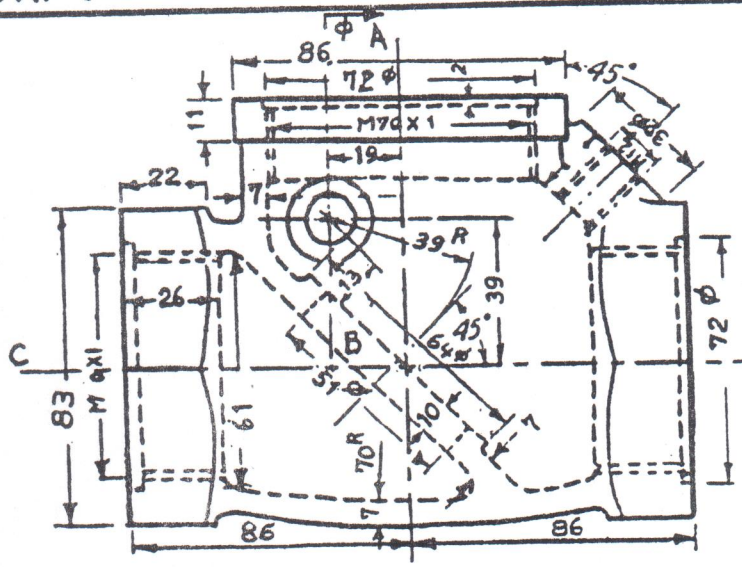
HINGE (ST.) NO. OFF 1



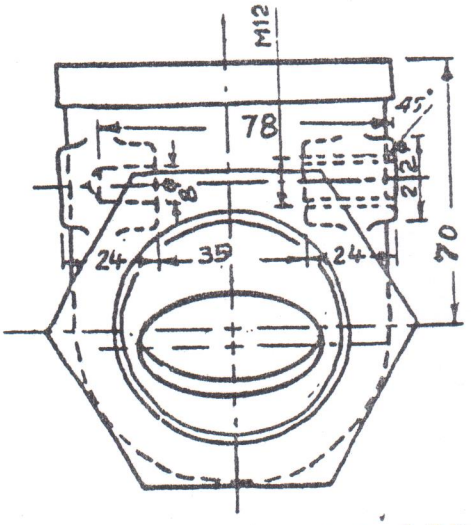
CAP (BRZ.) NO. OFF 1



VALVE (BRZ.) NO. OFF 1



VALVE BODY (BRZ.)



NO. OFF 1

You are given the details of a CHECK VALVE.
Assemble all parts and draw to full size the following:
1- SEC. ELEV. 2- H. SEC. SIDE VIEW (A-B-C)
3- PLAN
All dims. in mm and all unspecified radii are 2R.