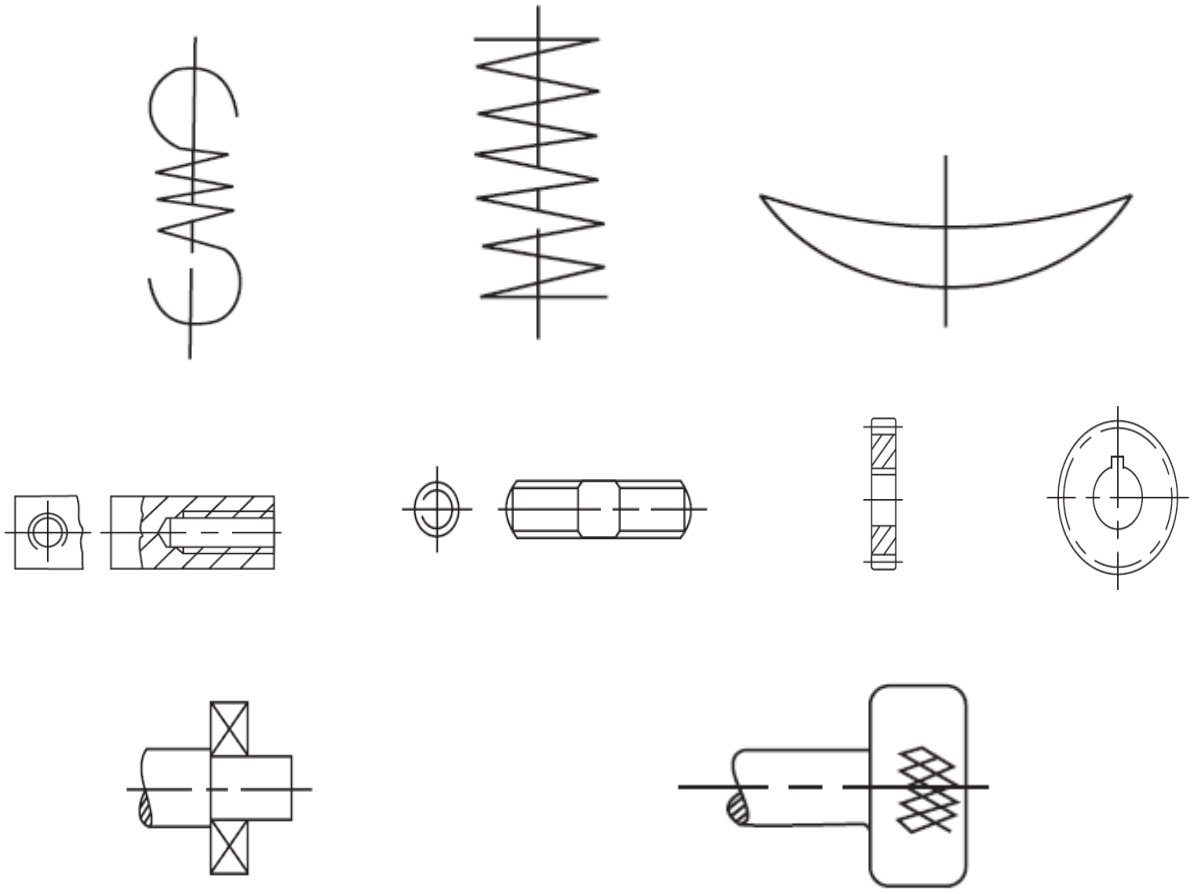
PART –A IMPORTANT QUESTIONS

1) Give the conventional representation of a cylindrical helical tension spring, cylindrical helical compression spring,semi-elliptic leaf spring, internal threading,external threading,spur gear,bearings and diamond knurling.



2) What are the different standard sizes of drawing sheets? Give their designations and sizes.

- There are five standard sizes for drawing sheets,specified by Bureau of Indian Standards (BIS) SP: 46-1988, as given below.
- Drawing sheets may be used with their longer sides positioned horizontally.

Designation	Dimensions (mm)
A0	841 X 1189
A1	594 X 841
A2	420 X 594
A3	297 X 420
A4	210 X 297

3) What are the Elements of production drawing?

- Following are the basic elements of a production drawing.
- Format of drawing sheet,
- Size and shape of the component,
- Projection method,
- Material specification and shape such as castings,forgings, plates, rounds, etc.,
- Indication of surface roughness and other heat treatments, if any,
- Limits, fits and tolerances of size, form, and position,
- Production method,
- Process sheet,
- Specification of standard components,
- Conventions used to represent certain machine components,
- Inspection and testing methods.

4) What do you mean by production Drawing?

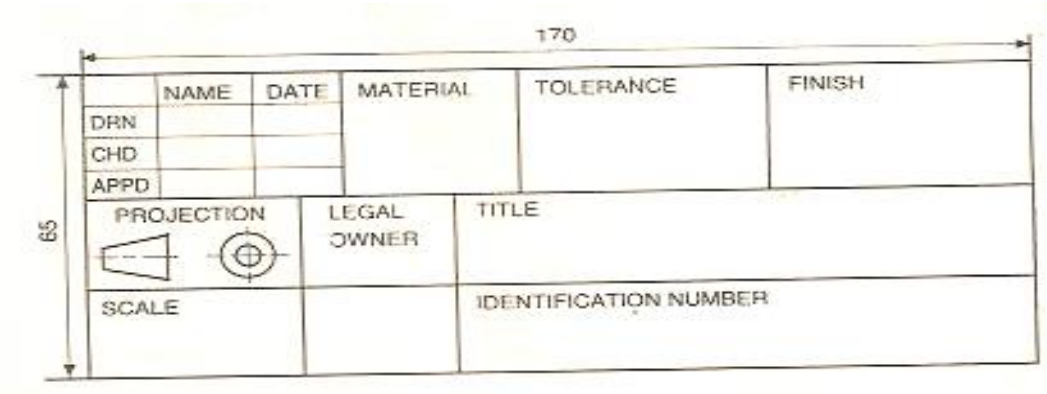
production Drawing

A component or part drawing is termed as a production drawing. It is an authorized document to produce the component in the shop floor.

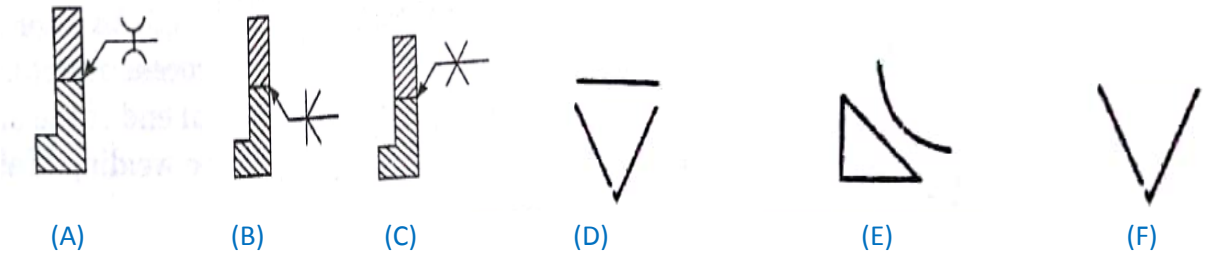
5) Draw and describe about industrial oriented title block?

A production drawing may include the following additional information, located either in the drawing sheet or in the title block:

1. Job order number,
2. Surface treatment, roughness, etc.,
3. Key to machining and other symbols,
4. A general note on tolerance on dimensions, not individually tolerance.
5. Reference to tools, gauges, jigs and fixtures,
6. Parts list, and
7. Alternations and revisions.



6) Write down the meaning of the weld symbols as shown in below.



(A) (B) (C) (D) (E) (F)

(A) Double – U butt weld
(B) Double – bevel butt weld (K weld)
(C) Double – V butt weld (X weld)
D)Flat- Single V-butt weld
E)concave fillet weld
F)Single V-butt weld

7) Draw the symbol for fixed displacement hydraulic pump Bi-directional

8) Define interchangeability.

The term interchangeability refers to the parts which go into the assembly at random, from a lot.
Eg:- A nut and a bolt of a particular size may be assembled by selecting at random from the lots. In this any nut should be able to get assembled with any bolt.

9) Define tolerance, types with examples allowance.

TOLERANCE :-

It is the difference between the maximum and minimum permissible limits of the given size.

Tolerance = upper limit – lower limit.

If the variation is provided on one side of the basic size it is termed as unilateral tolerance. Similarly, if the variation is provided on both sides of the basic size, it is known as bilateral tolerance.

ALLOWANCE :-

It is the internal difference between the hole and shaft dimensions after their assembly is called allowance.

10) What is fit and **what are the various types of fits?**

FIT:-It is the degree of looseness or tightness between two mating parts to perform a definite function.

TYPES OF FITS:-

There are three types of fits
1)Clearance fit
2)Interference Fit
3)Transition Fit

11) what are the various types of fits?explain briefly?

1)Clearance fit

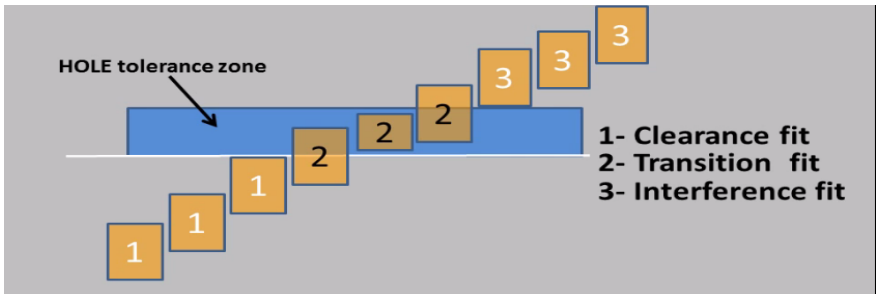
This fit arises when the diameter of shat is smaller than hole. The minimum diameter of hole is greater than the largest permissible diameter of the shaft. The value of clearance fit is always positive.

2)Interference Fit

In this type of fit the minimum permissible diameter of the shaft is larger than the maximum allowable diameter of the hole. As the diameter of shaft is larger than the diameter of hole, the hole and shaft are intended to be attached permanently.

3)Transition Fit

This fit may result in either interference or a clearance, depending on the actual values of the tolerance of individual parts.



12) What is the difference between hole basis system and shaft basis system.

HOLE BASIS SYSTEM

In this system Hole is kept constant, Shaft size is varied to get different fits.

SHAFT BASIS SYSTEM

In this system Shaft is kept constant, Hole size is varied to get different fits.

13) Expand the following abbreviations

a) HTS (HIGH TENSILE STEEL) b)CHD (CHECKED) c)CrS (CHROMIUM STEEL)

d) TCS (TUNGSTEN CARBIDE STEEL) e)CRS (centres) f)CSK (COUNTER SUNK)

g) BRG (BEARING)

14) For the following assemblies, with a basic size of 50mm calculate Hole tolerance , shaft tolerance, minimum and maximum allowance and type of fit.

a)H7/g6 b)H8/k6

For the following assemblies, with a basic size of 50mm calculate hole tolerance, shaft tolerance, minimum and maximum allowance and type of fit.

a) H7/g6 b) H8/K6

Sol Given Data:

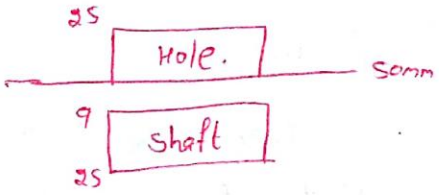
Basic size = 50mm.

a) H7/g6

From tolerance tables at ø50mm the limits for shaft is 50^{-9}_{-25} and for hole the limits are 50^{+25}_{+0}

Hole $50^{+25}_{+0} = 50^{0.025}_{0.000}$

Shaft $50^{-9}_{-25} = 50^{0.009}_{0.025}$



we know

Tolerance = Upper limit − Lower limit

i) Hole tolerance = Upper limit of hole − Lower Limit of hole

= 50.025 − 50.000

= 0.025 mm.

ii) Shaft tolerance = Upper limit of shaft − Lower Limit of shaft

= 49.991 − 49.975

= 0.016 mm.

iii) minimum allowance = ~~Upper Limit of~~

= Lower Limit of hole − Upper Limit of shaft

= 50.000 − 49.991

= 0.009 mm

iv) maximum allowance = Upper Limit of hole − Lower Limit of shaft

= 50.025 − 49.975

= 0.05 mm.

v) Type of fit :-

From the above diagram it is clear that the given fit is clearance fit.

b) H8/K6

From the tolerance tables the upper and lower Limit for basic size 50mm at H8 & K6 are

Hole 50^{+39}_{+0} = $50^{0.039}_{0.000}$

Shaft 50^{+18}_{+2} = $50^{+0.018}_{+0.002}$

i) Hole tolerance = 50.039 − 50.000 = 0.039 mm

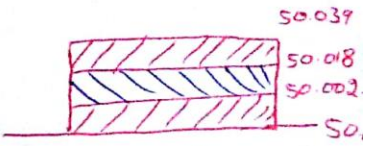
ii) Shaf tolerance = 50.018 − 50.002 = 0.016 mm

iii) minimum allowance = 50.000 − 50.018 = − 0.018 mm

iv) maximum allowance = 50.039 − 50.002 = 0.037 mm

v) Type of fit :-

From the figure (b) it is clear that the given fit is TRANSITION FIT.

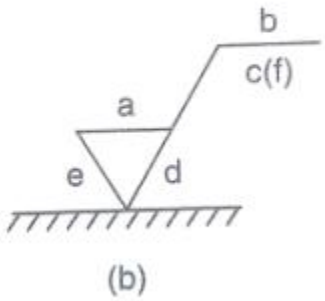


(b)

15) Find the limits of the following shafts and holes 20h6,60p7,20H6 and 75H11.

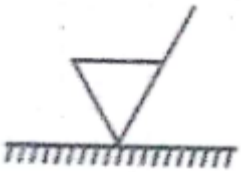
16) State the type of fit obtained for hole diameter 33.00mm & 33.24mm and shaft diameter 33.11mm & 34.05mm.

17) Draw the symbol for surface roughness and abbreviate a,b,c,d,e and f.



a = Roughness value R_a
b = Production method, treatment or coating
c = Sampling length
d = Direction of lay
e = Machining allowance
f = Other roughness values

18) What is the meaning of below mentioned sybols.



(A)

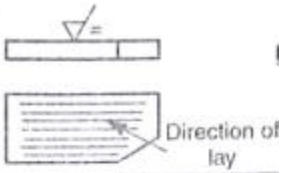
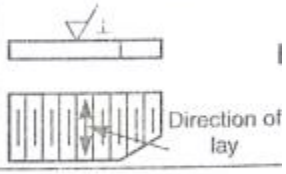
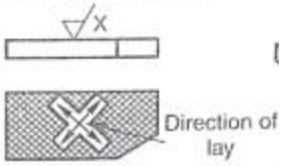
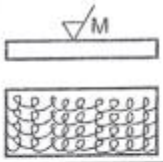
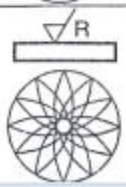
(B)

(A) Basic symbol used when the removal of material by machining process is needed.
(B) Basic symbol used when the removal of material is not allowed.

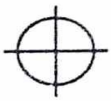
19) What are the surface finish values for Lapping,Honning,burnishing, Grinding,filing, turning and milling, Reaming, Hobbing,Drilling and sand casting in microns.

Lapping	-	0.012 to 0.16
Honning	-	0.025 to 0.4
Burnishing	-	0.04 to 0.8
Grinding	-	0.063 to 5
Filing	-	0.25 to 25
Turning and milling	-	0.32 to 25
Reaming	-	0.4 to 3.2
hobbing	-	0.4 to 3.2
Drilling	-	1.6 to 20
sand casting	-	5 to 50

20) Specify all the direction of lay and their meaning which are represented in surface roughness.

=	Parallel to the plane of projection of the view in which the symbol is used	
⊥	Perpendicular to the plane of projection of the view in which the symbol is used	
X	Crossed in two slant directions relative to the plane of projection of the view in which the symbol is used	
M	Multi-directional	
C	Approximately circular relative to the centre of the surface to which the symbol is applied	
R	Approximately radial relative to the centre of the surface to which the symbol is applied	

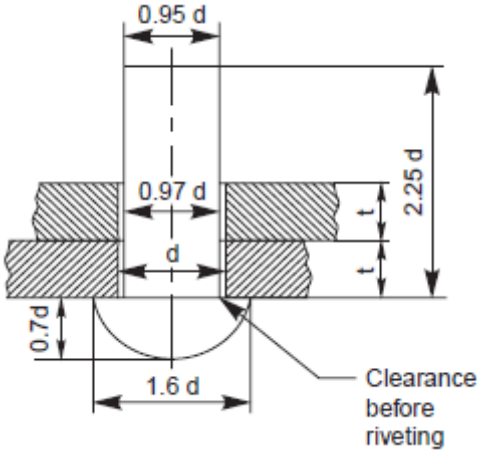
21) What are the symbols for the following
Cylindricity,profile of any line,profile of any surface, parallelism,angularity,position, concentricity, symmetry.

Cylindricity	
Profile of any line	
Profile of any surface	
Parallelism	
Perpendicularity (squareness)	
Angularity	
Position	
Concentricity and coaxiality	
Symmetry	

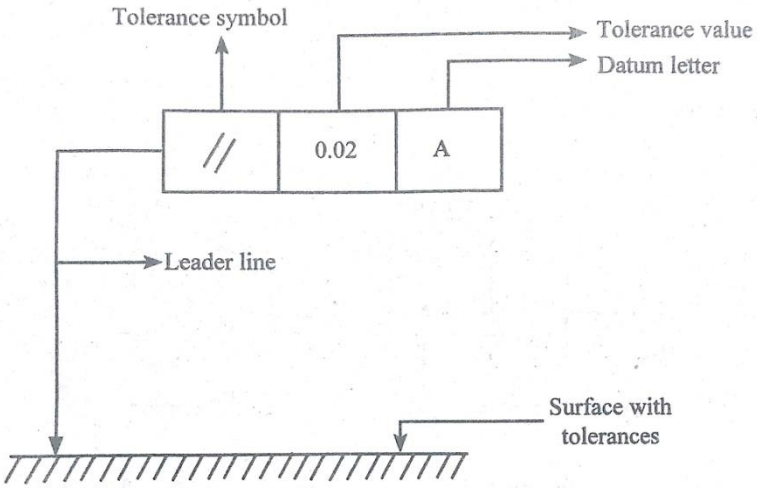
22) Give the description for the following notes on a drawing.
THD RELIEF, Ø30 WIDE 4.
6 HOLES, EQUI-SP DIA 17 C BORE FOR M16 SOCKET HD CAP SCR.
DIA 25 DEEP 25
DIA 10 CSK DIA 15

NOTE	MEANING
THD RELIEF, Ø30 WIDE 4.	Cut a relief for thread with a diameter of 30mm and width 4mm
6 HOLES, EQUI-SP DIA 17 C BORE FOR M16 SOCKET HD CAP SCR.	Drill a through hole of dia 17 and counterbore to insert a socket headed cap screw of M16. Six holes are to be made equi-spaced on the circle.
DIA 25 DEEP 25	Drill a hole of diameter 25mm, to a depth of 25mm
DIA 10 CSK DIA 15	Drill a through hole of diameter 10mm and countersink to get 15mm on top.

23) Mention the standard representation for rivet.



24) Explain all orientation symbols in geometric dimensioning tolerance with example.



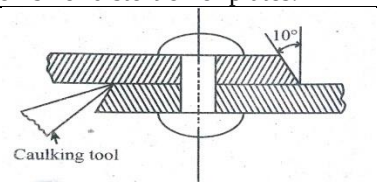
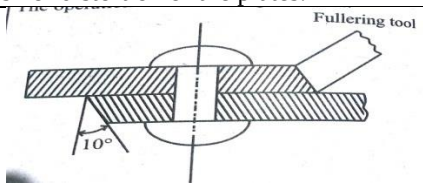
25) Indicate the roughness symbols and roughness values for roughness N1,N2,N5 and N9.

Roughness grades	Roughness values (R_a) in microns	Roughness symbol
N1	0.025	
N2	0.05	
N5	0.4	
N9	6.3	
N10	12.5	

26) Explain the position of the symbol with regard to the reference line

Single V – Butt weld at arrow side.

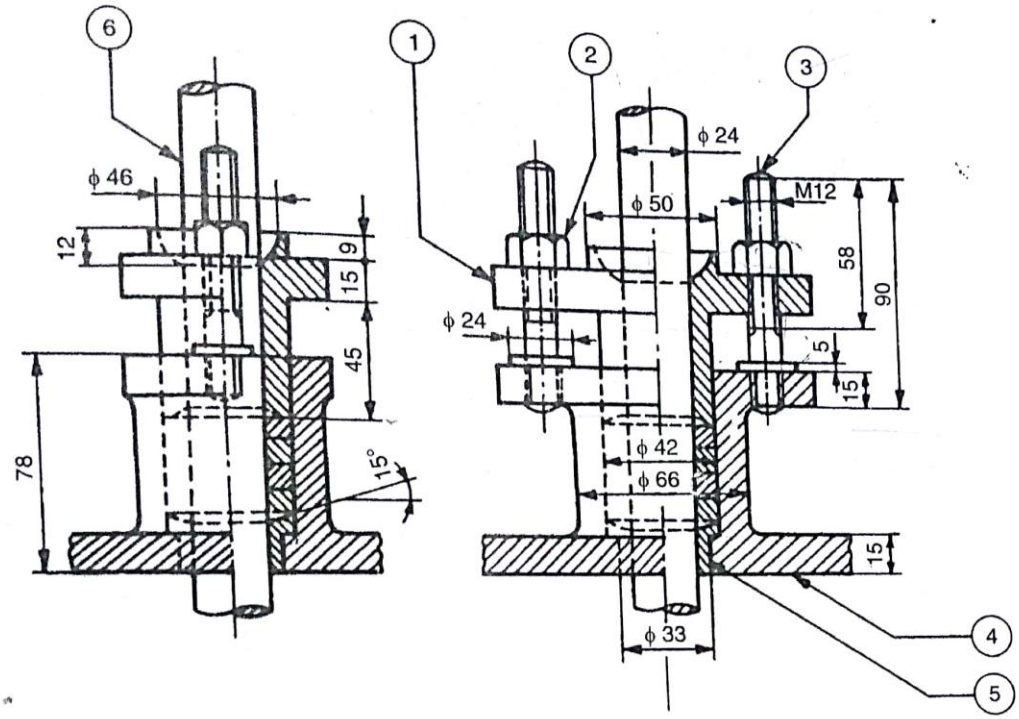
27) What is the difference between caulking and fullering.

Caulking	Fullering
It is used to obtain leak proof joints.	It is also used to obtain leak proof joints.
It is carried out by using a narrow blunt tool called caulking tool.	It is carried out by using fullering tool.
The thickness of the tool is about 5mm.	The thickness of the tool is equal to the thickness of the plates.
Surface finish obtained is less.	Surface finish obtained is more.
More risk of distortion of plates.	Less risk of distortion of the plates.
	

PART –B IMPORTANT QUESTIONS

Q1). Study the given assembly drawing of the Stuffing Box as shown in below figure.

a) **Draw the component drawings.**
b) **Apply suitable tolerances and fits.**
c) **Apply suitable geometrical tolerances to components.**
d) **Show the surface roughness symbols.**
e) **Prepare the process sheet for Gland.**



Parts List

Part No.	Name	Matl.	Qty.
1	Gland	Brass	1
2	Nut, M12	MS	2
3	Stud	MS	2
4	Body	CI	1
5	Bush	Brass	1
6	Shaft	MS	1

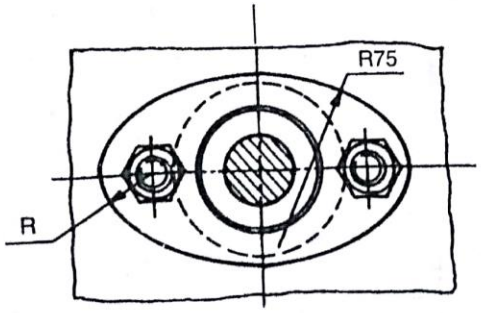


Fig 9.12 Stuffing box

1ANS)

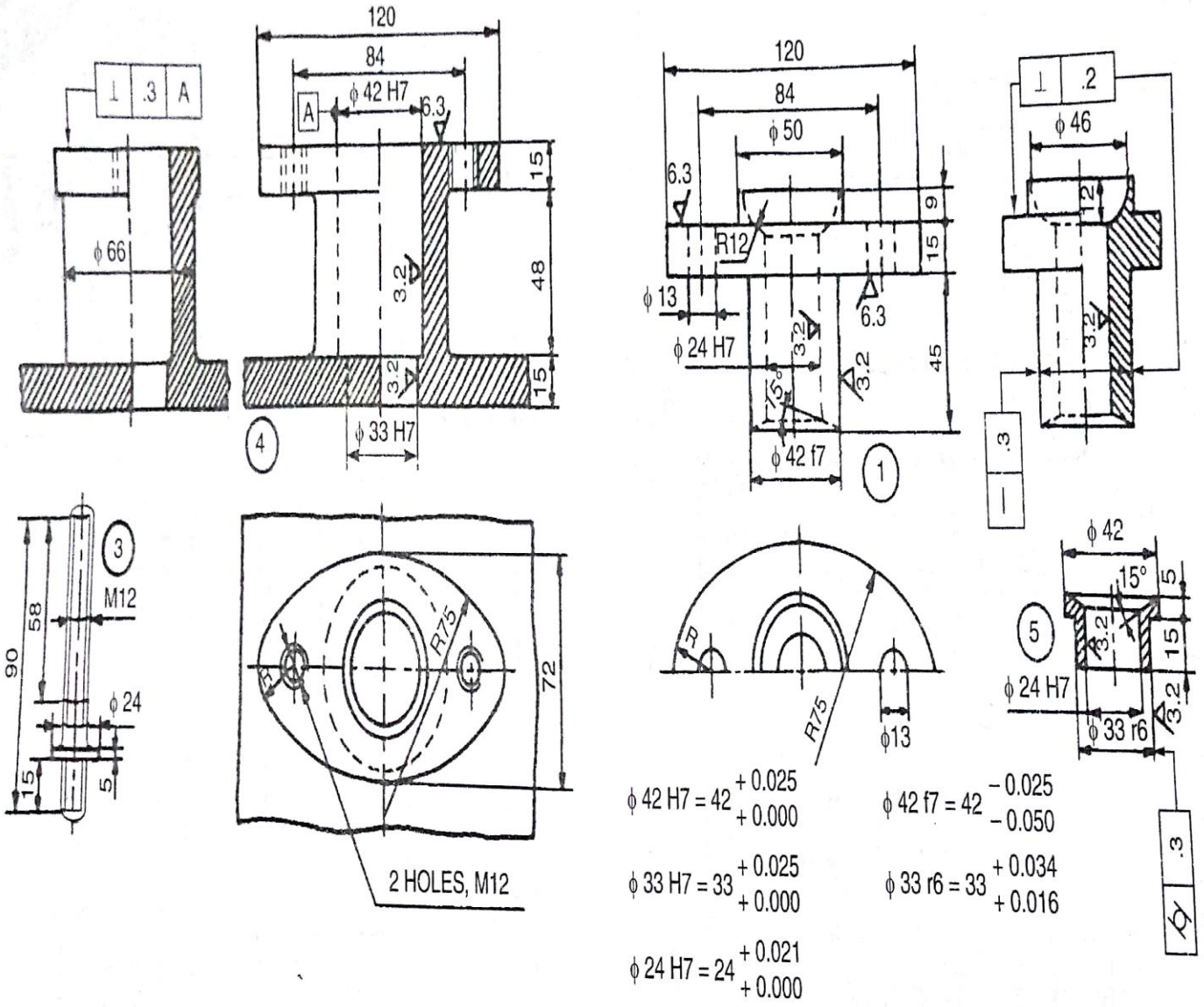
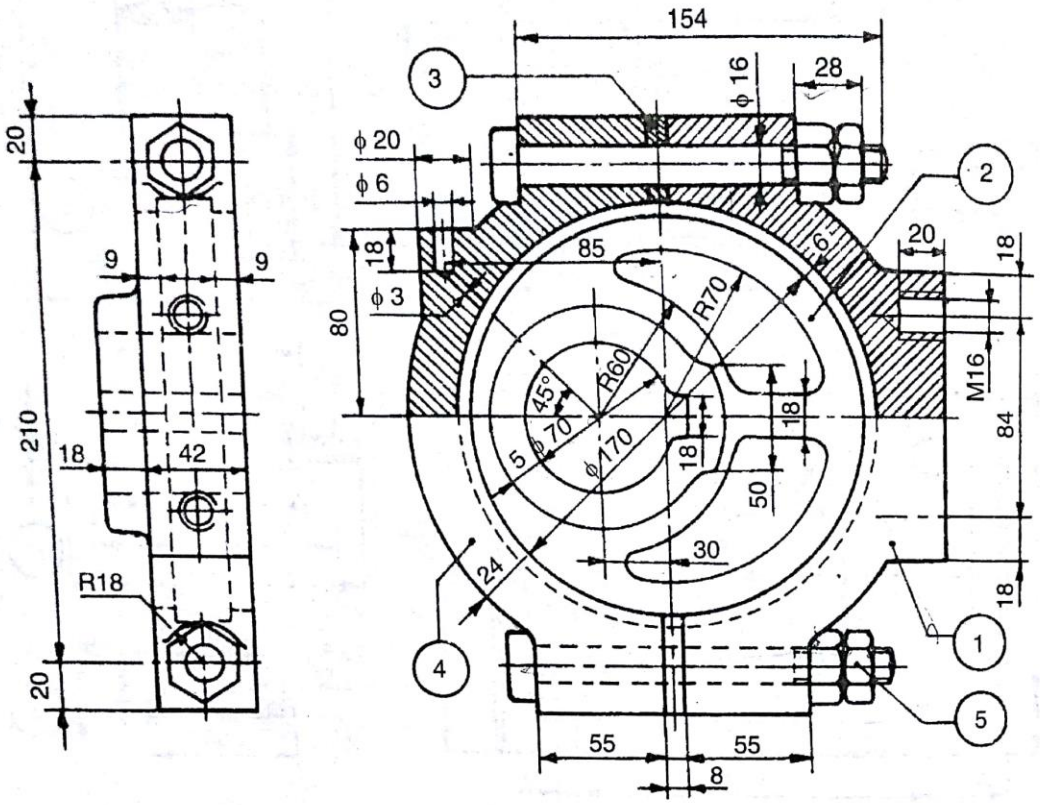


Fig. 9.13 Details of stuffing box

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the dimensions of component	Vernier calipers			
10	Lathe	Fix the component in chuck through portion ϕ 50 × 9 mm and perform facing on the end and oval section of gland.	Facing tool			
15	Lathe	Turn the component ϕ 42 × 45 mm	Turning tool			
20	Lathe	Drill ϕ 20 mm hole	Drill bit			
25	Lathe	Bore the hole upto ϕ 24 mm	Boring tool			
30	Lathe	Chamfer the hole end	Turning tool			
35	Lathe	Reverse the component				
40	Lathe	Face the end and flange surface	Facing tool			
45	Lathe	Turn the component ϕ 50 mm	Turning tool			
50	Lathe	Bore R12	Boring tool			
55	Drilling machine	Drill two holes of ϕ 13 mm	Drill jig			
60	–	Inspect and verify the component size	Outside micrometer, vernier caliper, etc.			

Q2). Study the given assembly drawing of the Eccentric as shown in below figure.

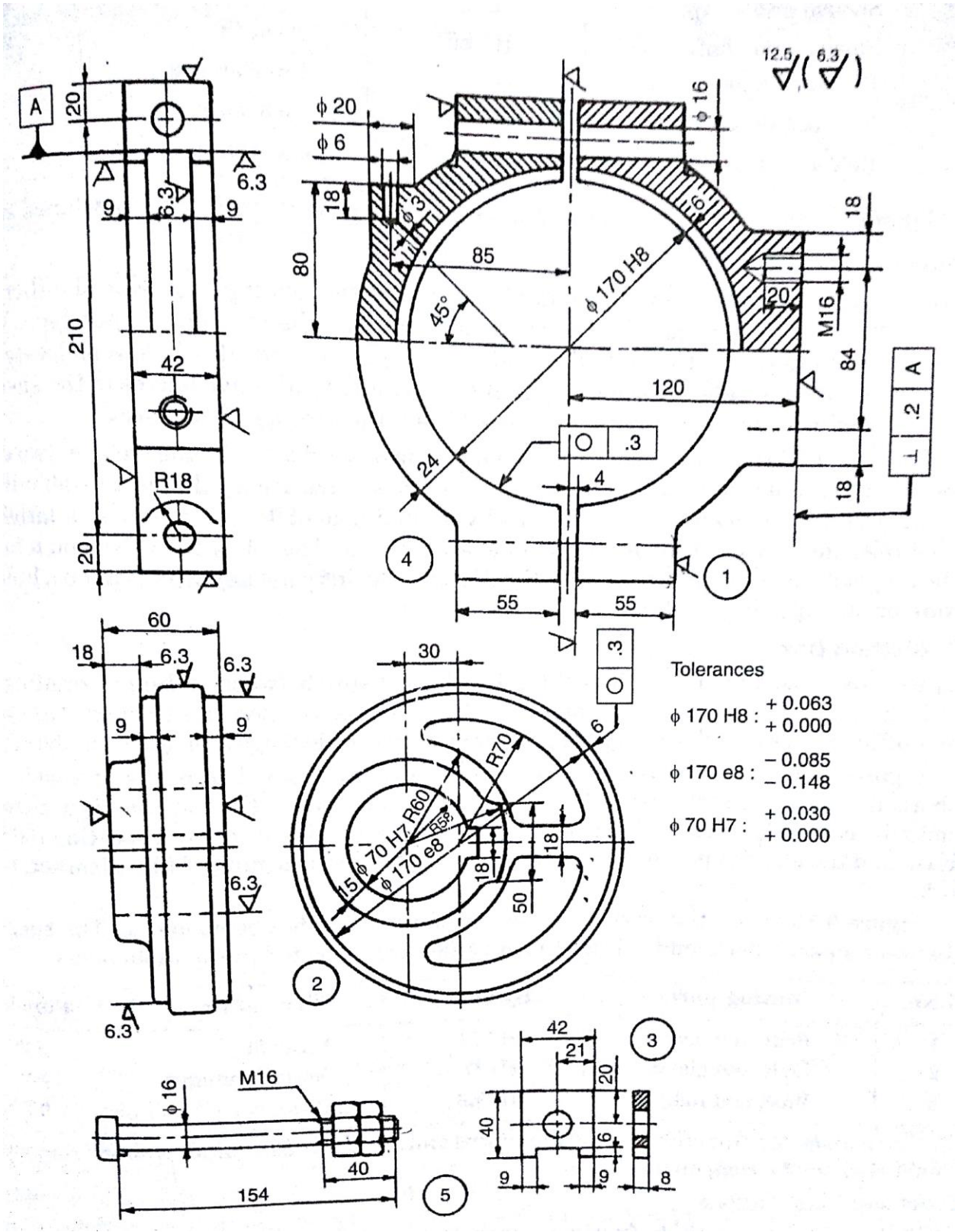
a) **Draw the component drawings.**
b) **Apply suitable tolerances and fits.**
c) **Apply suitable geometrical tolerances to components.**
d) **Show the surface roughness symbols.**
e) **Prepare the process sheet for Straps.**



Parts List

Part No.	Qty.	Name	Matl.
1	1	Strap	CI
2	1	Sheave	CI
3	2	Shim	Brass
4	1	Strap	CI
5	2	Bolt with nuts	MS

2ANS)


A
20
6.3
9
6.3
9
210
42
R18
20
60
18
6.3
6.3
9
9
6.3
6.3
ϕ 20
ϕ 6
18
ϕ 3
80
85
45°
ϕ 170 H8
ϕ 16
6
18
20
M16
84
120
24
.3
4
18
A
.2
4
1
55
55
12.5
6.3
30
.3
6
R70
R60
R58
ϕ 70 H7
ϕ 170 e8
15
18
18
50
2
Tolerances
ϕ 170 H8 : + 0.063 + 0.000
ϕ 170 e8 : − 0.085 − 0.148
ϕ 70 H7 : + 0.030 + 0.000
42
21
3
20
40
6
9
9
8
ϕ 16
M16
40
154
5

Process Sheet

Part Name : Straps

Part Number : 1 and 4

Cycle Time :

Material : Cast iron

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the size of castings	Vernier calipers			
10	Milling	Slab-mill the faces of straps	Slab mill cutter			
15	Milling	Spot facing to provide seats for bolt heads	End mill cutter ϕ 40 mm			
20	Drilling	Drill holes of ϕ 16 mm	Drill ϕ 16 mm			
25	Lathe	Fix the straps along with a 8 mm spacer in between onto a turning fixture.				
30	Lathe	Bore ϕ 170	Boring tool			
35	Lathe	Bore ϕ 182 × 24 grooves on the straps	Boring tool			
40	Drilling	Drill and tap M16 hole	Drill bit and tap			
45	Drilling	Drill two oil holes in straps	Drills ϕ 6 mm and ϕ 3 mm			
50	–	Inspect the finished component	Boring gauge and varnier caliper			

Q3)From the Given assemble drawing answer the following

a)Give the fits for the following.

i)Nut and Screw

ii)Tommy bar and Screw

iii)Body and Nut

b)Draw the following components drawings and give necessary dimensional and geometric tolerances, surface roughness values,

i)Body

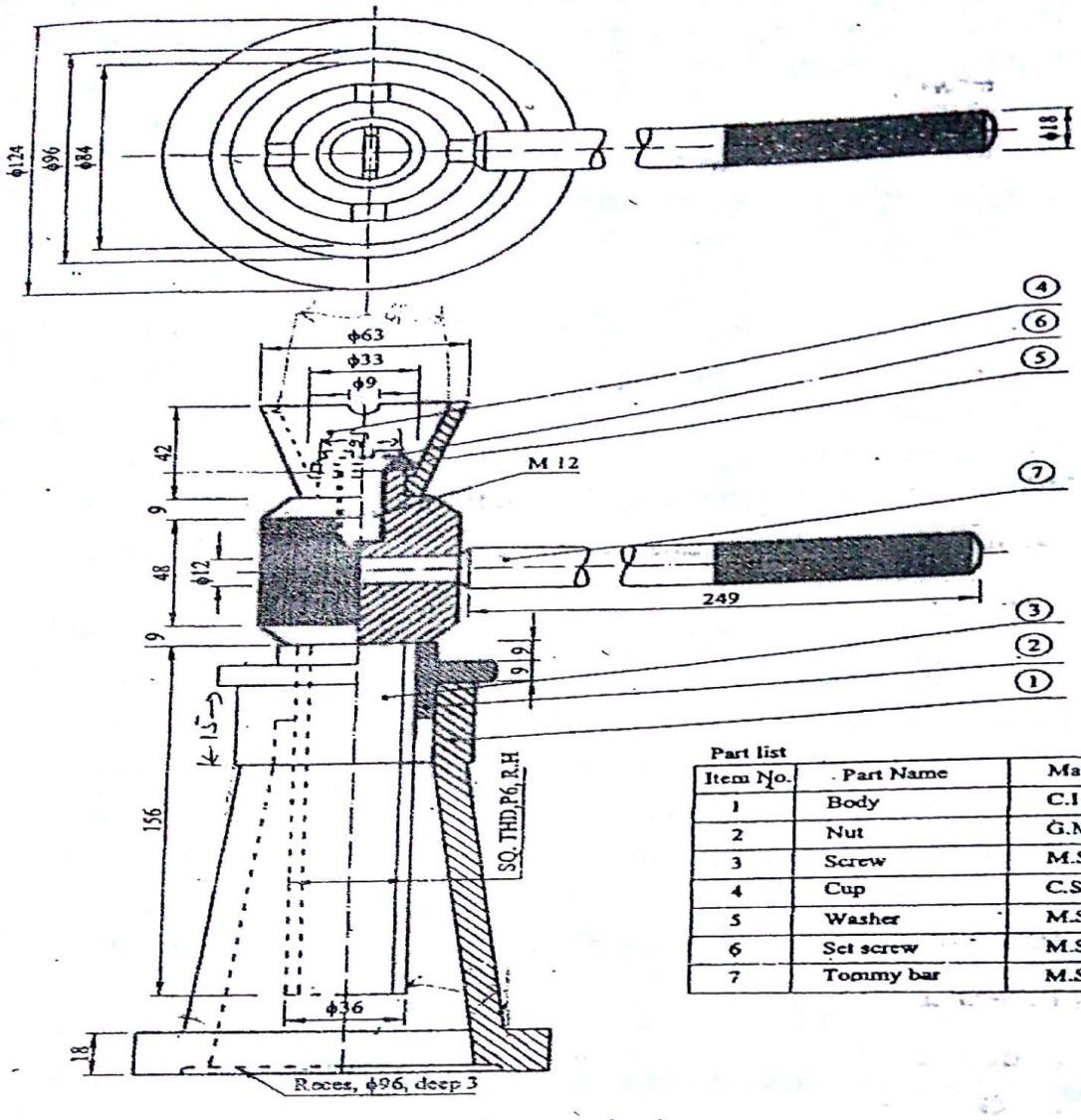
ii)CUP

iii)Screw

iv)Tommy Bar

c)Give the process sheet for the Screw and for the tommy bar.

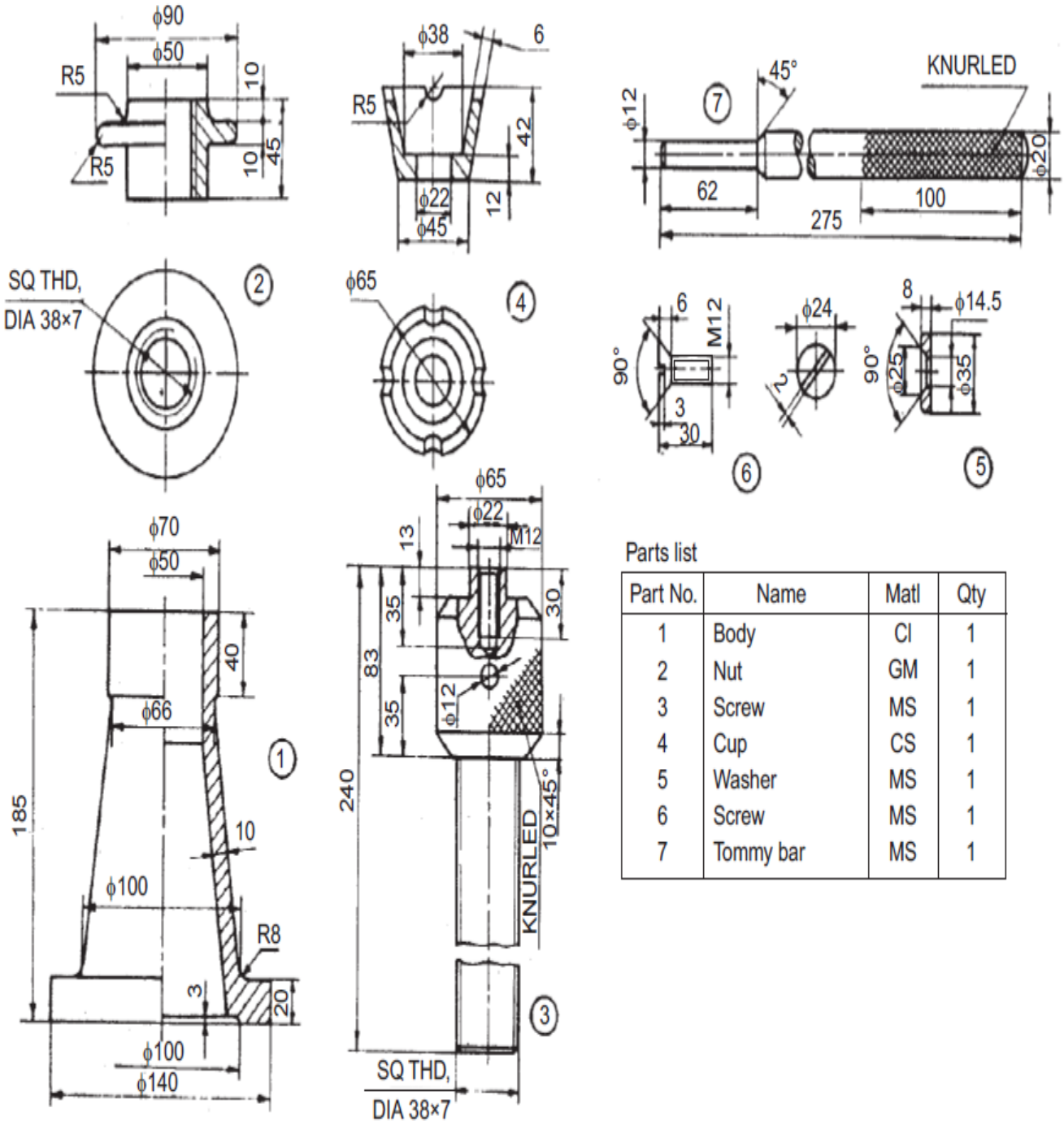
From the screw jack shown in Figure. 1



Part list

Item No.	Part Name	Material	Qty.
1	Body	C.I	1
2	Nut	G.M	1
3	Screw	M.S	1
4	Cup	C.S	1
5	Washer	M.S	1
6	Set screw	M.S	1
7	Tommy bar	M.S	1

3ANS)



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Nut	GM	1
3	Screw	MS	1
4	Cup	CS	1
5	Washer	MS	1
6	Screw	MS	1
7	Tommy bar	MS	1

Process Sheet for Tommy Bar

Part Name : Tommy Bar
Part Number : 4
Cycle Time :
Material : Mild Steel

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the stock size	Vernier calipers			
10	Lathe	Clamp the work on chuck and perform facing at end	Facing tool			
15	Lathe	Turn the work to ϕ 20 mm	Turning tool			Tool changing needed
20	Lathe	Turn the section ϕ 16 × 60 mm	Turning tool			
25	Lathe	Reverse the component and perform facing at other end	Facing tool			Tool changing needed
30	Lathe	Knurling the bar	Knurling tool			Tool changing needed
35	–	Inspect the finished component	Vernier calipers, etc.			

Process Sheet for Screw

Part Name : Screw
Part Number : 2
Cycle Time :
Material : Medium Carbon Steel

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the size of raw stock	Vernier calipers			
10	Lathe	Clamp the work on chuck and perform facing at the end.	Facing tool			
15	Lathe	Drill centre holes and mount the work between centres	Centre drill			
20	Lathe	Turn the sections ϕ36 mm, ϕ60 mm and ϕ25 mm	Turning tool			
25	Lathe	Produce three grooves	Parting tool			
30	Lathe	Chamfer the specified sections	Chamfering tool			
35	Lathe	Cutting square threads	Threading tool			
40	Lathe	Parting off the specified section	Parting tool			
45	Drilling	Drill cross holes of size ϕ16 mm	Drill bit			
50	Furnace	Hardening the surface of work	–			
55	–	Check the finished component	Vernier calipers and other suitable measuring instruments			

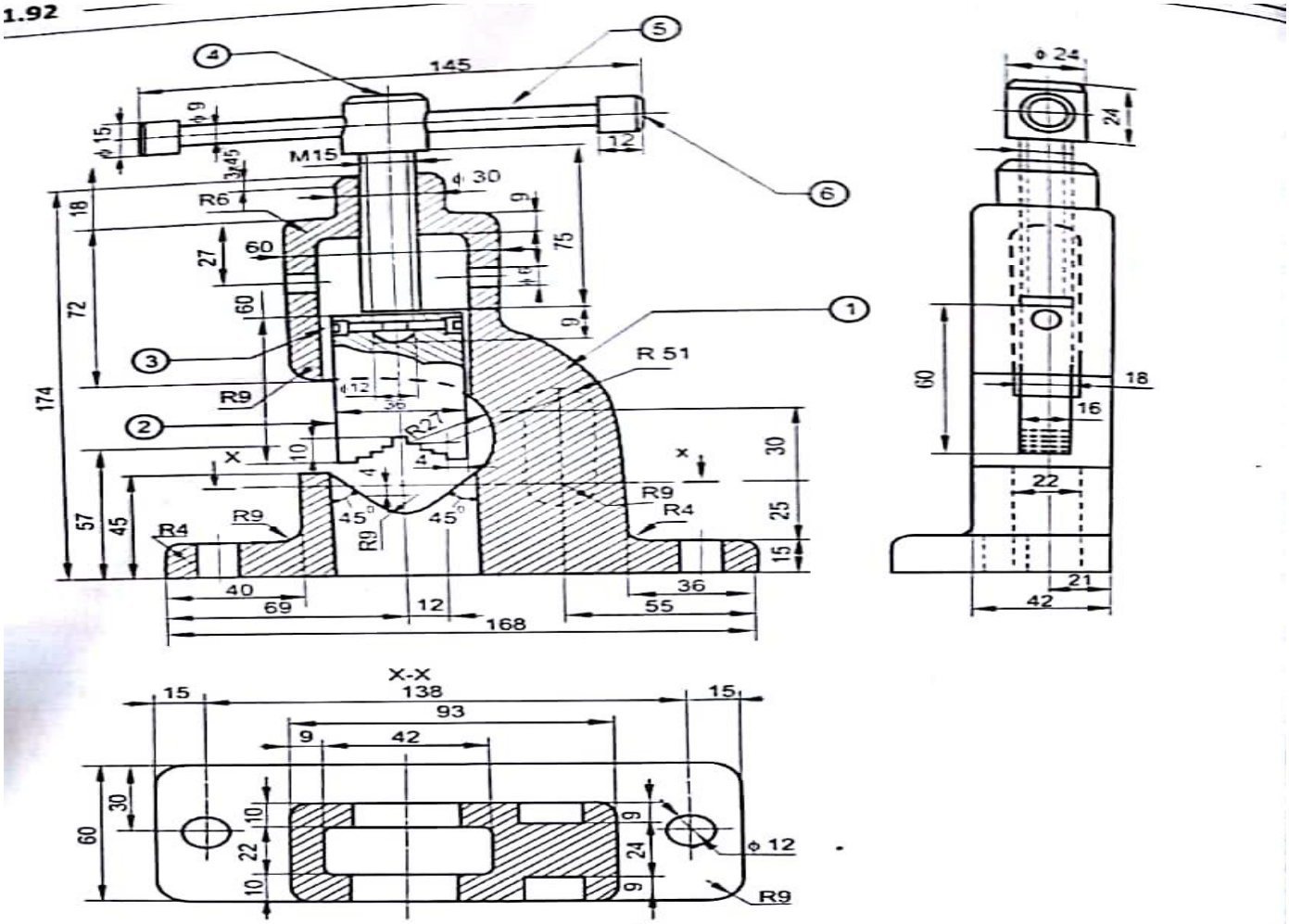
Q19. Study the following

Q4) From the assembly drawing of pipe vice as shown in below figure. Answer the following

a) **Give the fits for the following**
   i)Housing and Handle Screw
   ii) Handle bar and Handle bar cap

b) **Draw the following components drawings and give necessary dimensional and geometrical tolerances, surface roughness values and surface treatments.**
   i)Handle Screw ii)Handle bar iii)Handle bar cap
   iv)Movable Jaw v)set screw

c) **Give the process sheet for the Handle bar.**

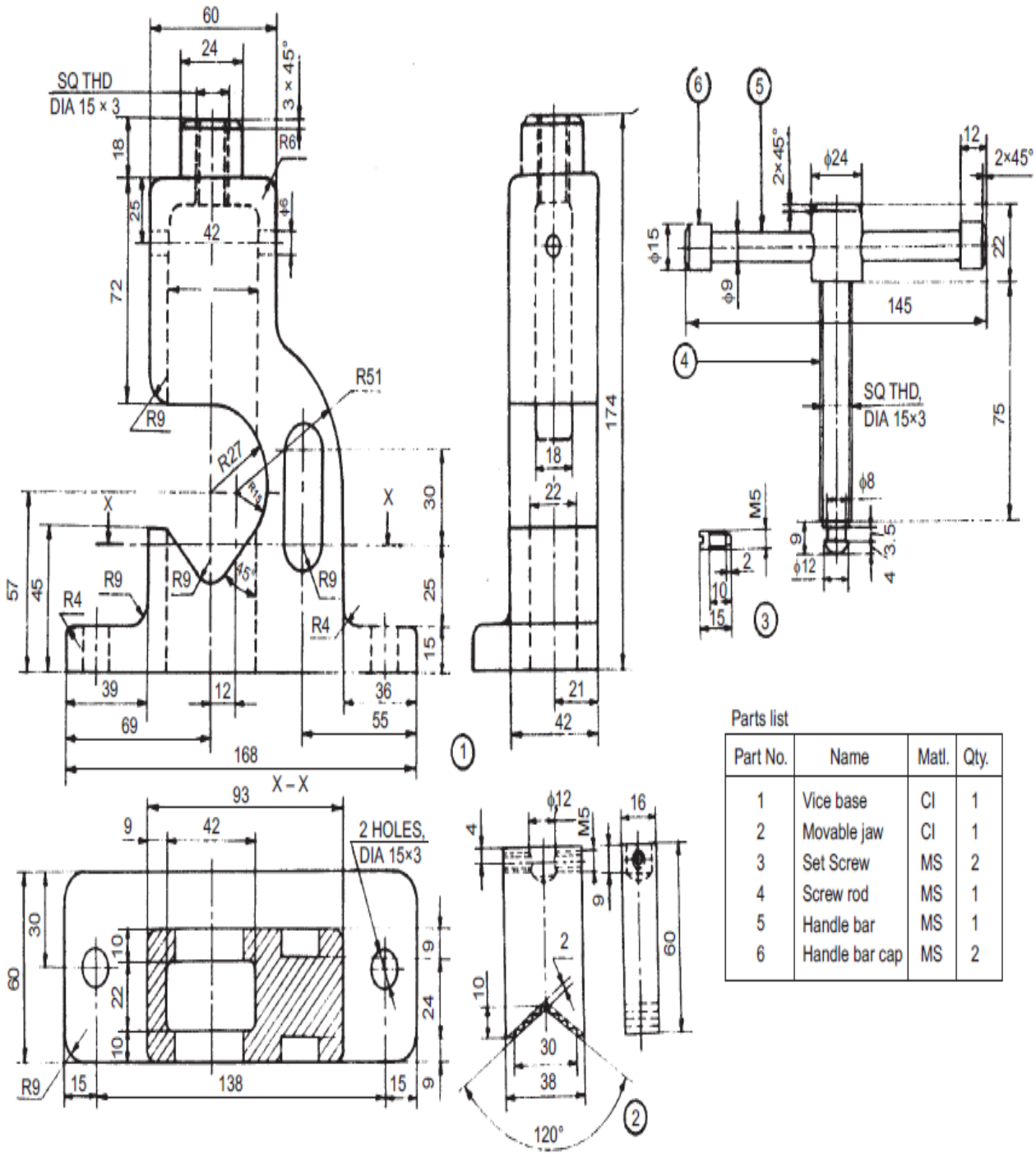


Bill of material

Part No.	Name	Raw material	Qty.
1.	Vice body	C.I – Casting	1
2.	Movable jaw	C.I – Casting	1
3.	Set-screw	MS – Std. Component	2
4.	Screw	MS – ϕ25 Bar stock	1
5.	Handle bar	MS – ϕ12 Bar stock	1
6.	Handle bar cap	MS – ϕ16 Bar stock	2

Fig. 11.30 *(a) Pipe Vice*

4ANS)



Parts list

Part No.	Name	Matl.	Qty.
1	Vice base	CI	1
2	Movable jaw	CI	1
3	Set Screw	MS	2
4	Screw rod	MS	1
5	Handle bar	MS	1
6	Handle bar cap	MS	2

PROCESS SHEET FOR HANDLE BAR

PART NO: 5

PART NAME : HANDLE BAR

QUANTITY :1

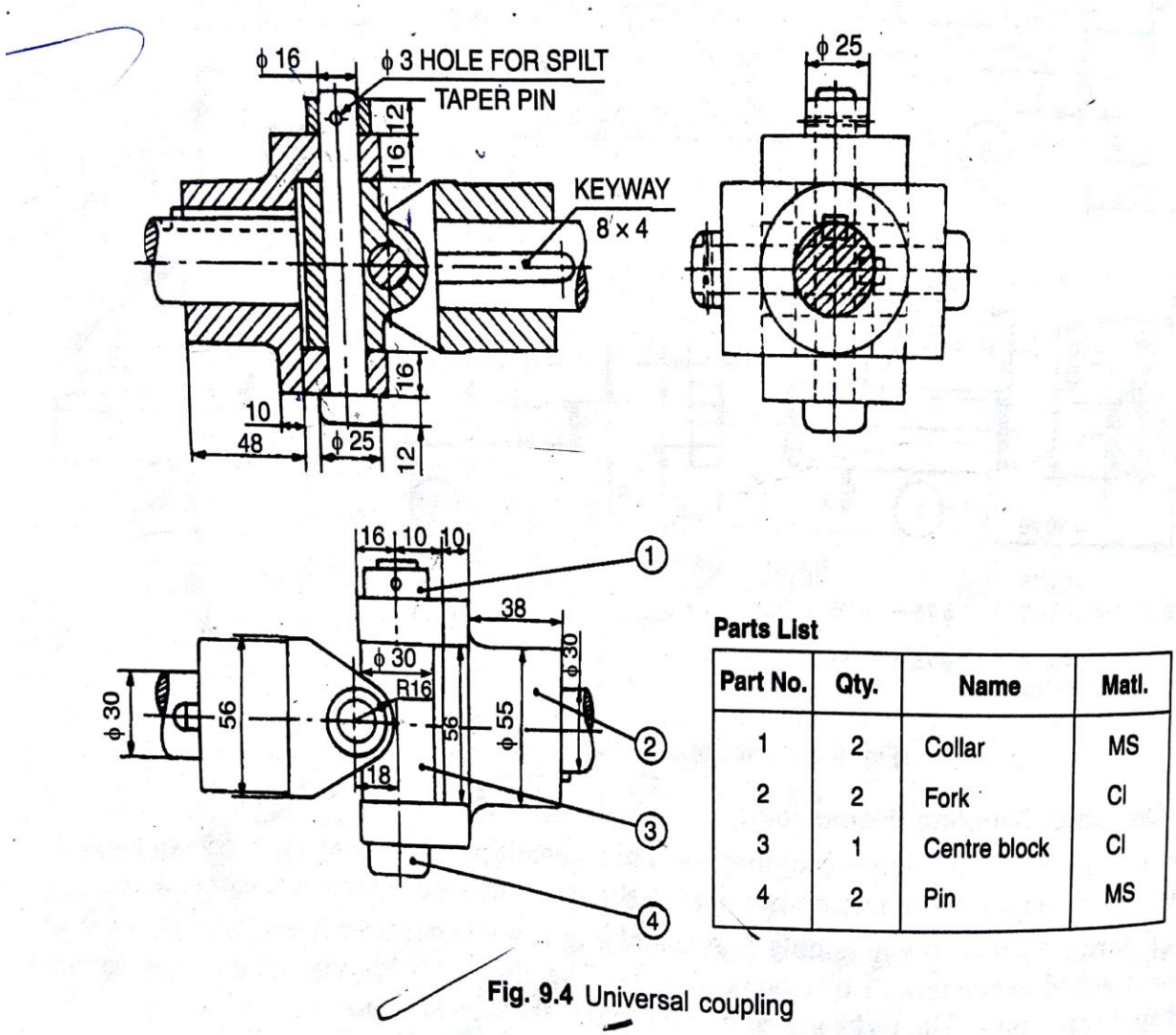
CYCLE TIME :

MATERIAL : MILD STEEL

Sequence	Machine	Operation	Tools & Gauges	Cycle Time		Remarks
				Setup Time (min)	Operation Time(min)	
05	-	Check the length and diameter of the raw material	Vernier Calipers	-	2	
10	Lathe	Turning	Turning tool	2	3	
15	Lathe	Facing on both ends	Facing tool	2	4	
20	Lathe	External threading on both ends to a distance of 12mm	External Threading tool	2	6	
25	-	Inspection	Vernier Calipers	-	1	

Q5). Study the given assembly drawing of the Universal Coupling as shown in below figure.

a) **Draw the component drawings.**
b) **Apply suitable tolerances and fits.**
c) **Apply suitable geometrical tolerances to components.**
d) **Show the surface roughness symbols.**
e) **Prepare the process sheet for FORK.**



Parts List

Part No.	Qty.	Name	Matl.
1	2	Collar	MS
2	2	Fork	CI
3	1	Centre block	CI
4	2	Pin	MS

Fig. 9.4 Universal coupling

5ANS)

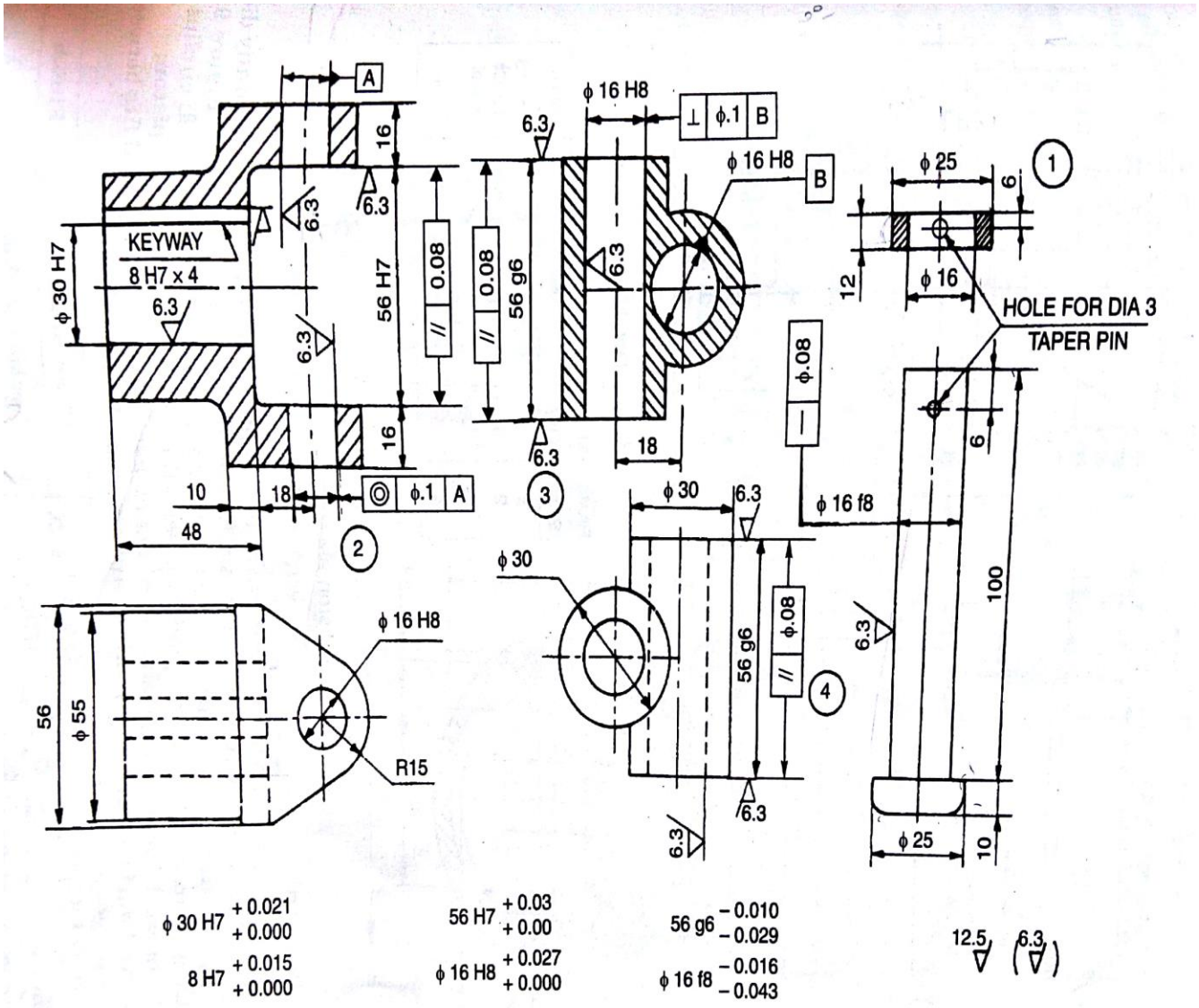


Fig. 9.5 Details of universal coupling

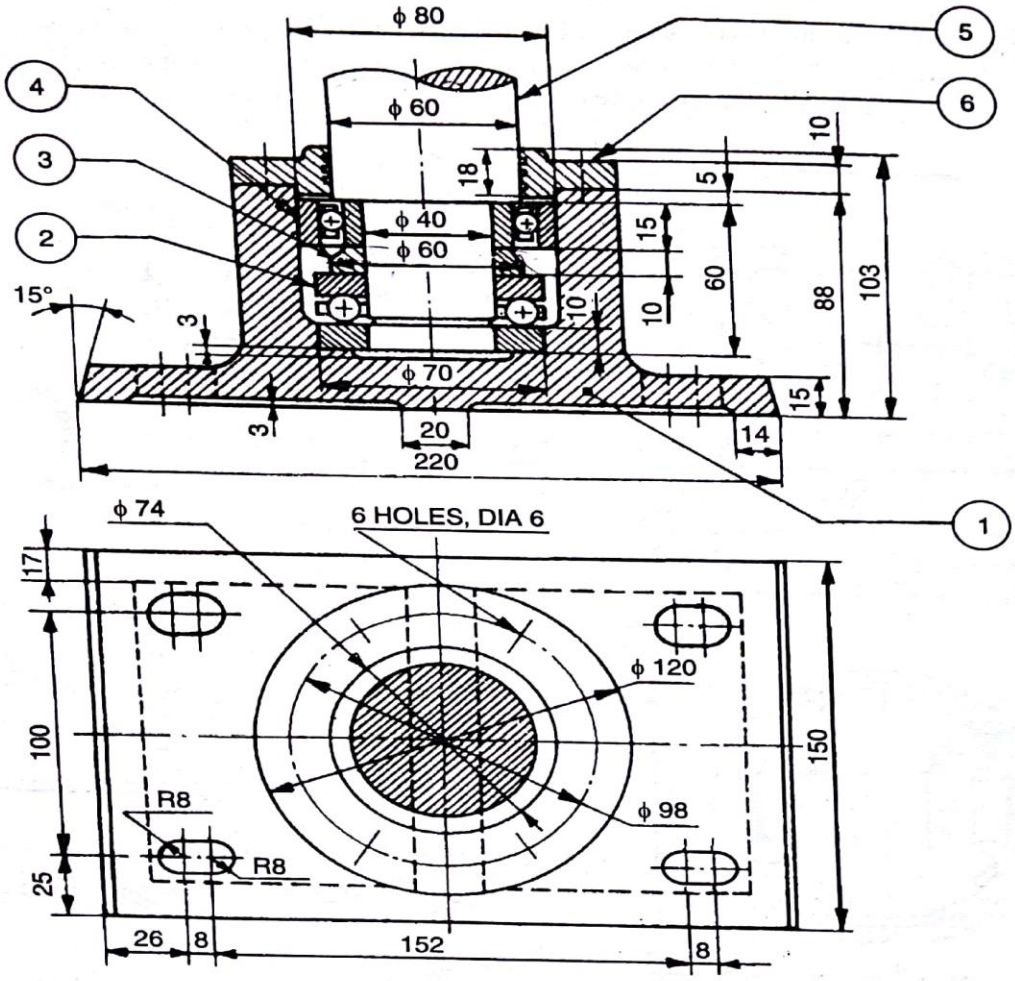
Process Sheet

Part Name : Fork
Part Number : 1
Cycle Time :
Material : Mild Steel

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the material size	Vernier calipers			
10	Lathe	Clamp the work on chuck and perform facing at end.	Facing tool			
15	Lathe	Turn the work to a size of ϕ 56 × 38 mm	Turning tool			Tool changing needed
20	Drilling machine	Clamp the work on drill jig and drill a hole of ϕ 30 mm throughout	Drill bit			
25	Drilling machine	Reaming the drilled hole	Reamer			Tool changing needed
30	Drilling machine	Clamp the work on drill jig and drill a hole of ϕ 16 × 88 mm	Drill bit			Tool changing needed
35	Drilling machine	Reaming ϕ 16 hole	Reamer			Tool changing needed
40	Slotting machine	Cut the key way	Slotting tool			
45	Grinding machine	Grinding the end portion i.e., 56 × 34 mm				
50	–	Inspect the finished component	Vernier calipers and other gauges			

Q6). Study the given assembly drawing of the Foot step bearing as shown in below figure.

a) **Draw the component drawings.**
b) **Apply suitable tolerances and fits.**
c) **Apply suitable geometrical tolerances to components.**
d) **Show the surface roughness symbols.**
e) **Prepare the process sheet for COVER.**

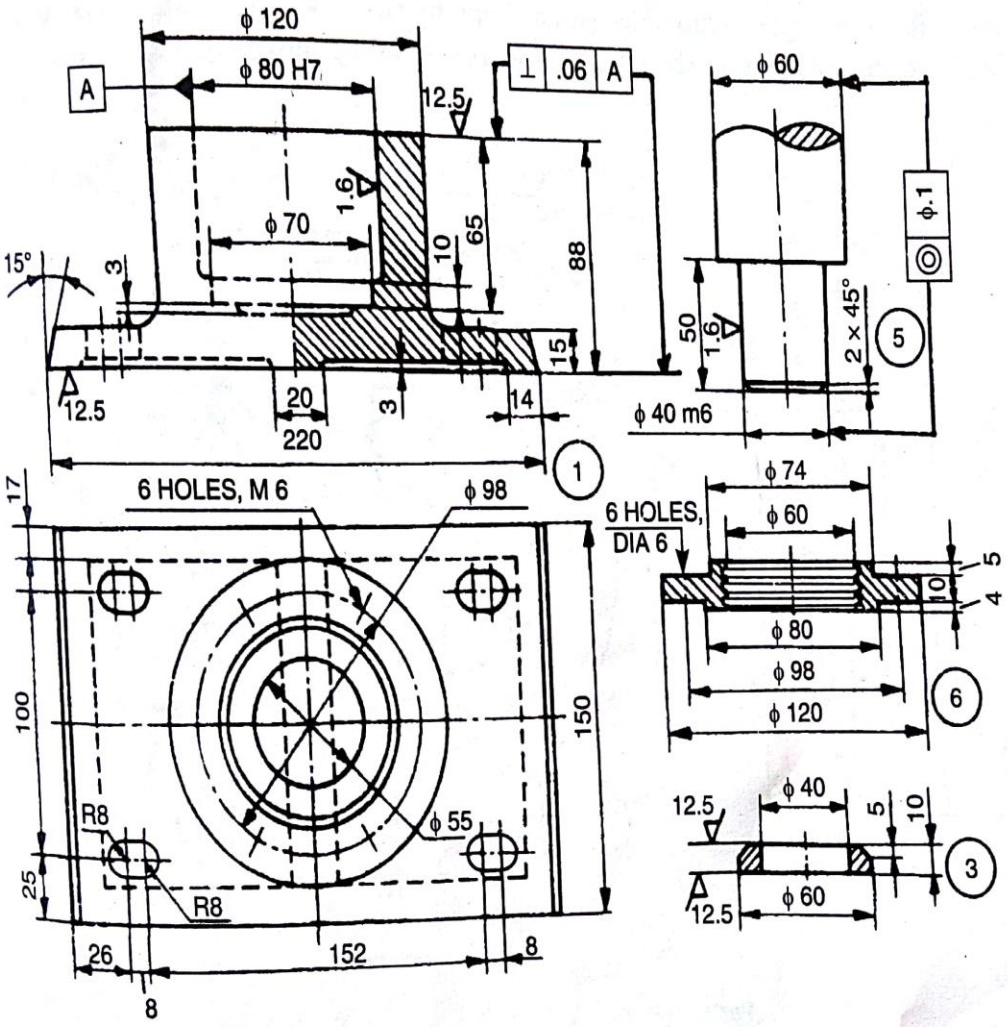


Parts List

Part No.	Qty.	Name	Matl.
1	1	Base	CI
2	1	Thrust bearing	—
3	1	Spacer	CI
4	1	Ball bearing	—
5	1	Shaft	MS
6	1	Cover	CI

Fig. 9.8 Footstep bearing

6ANS)



Tolerances

$$80\ H7 \text{ — } 80^{+0.030}_{+0.000}$$

$$40\ m6 \text{ — } 40^{+0.025}_{+0.009}$$

Fig. 9.9 Details of footstep bearing

Com

Process Sheet

Part Name : Cover

Part Number : 6

Cycle Time :

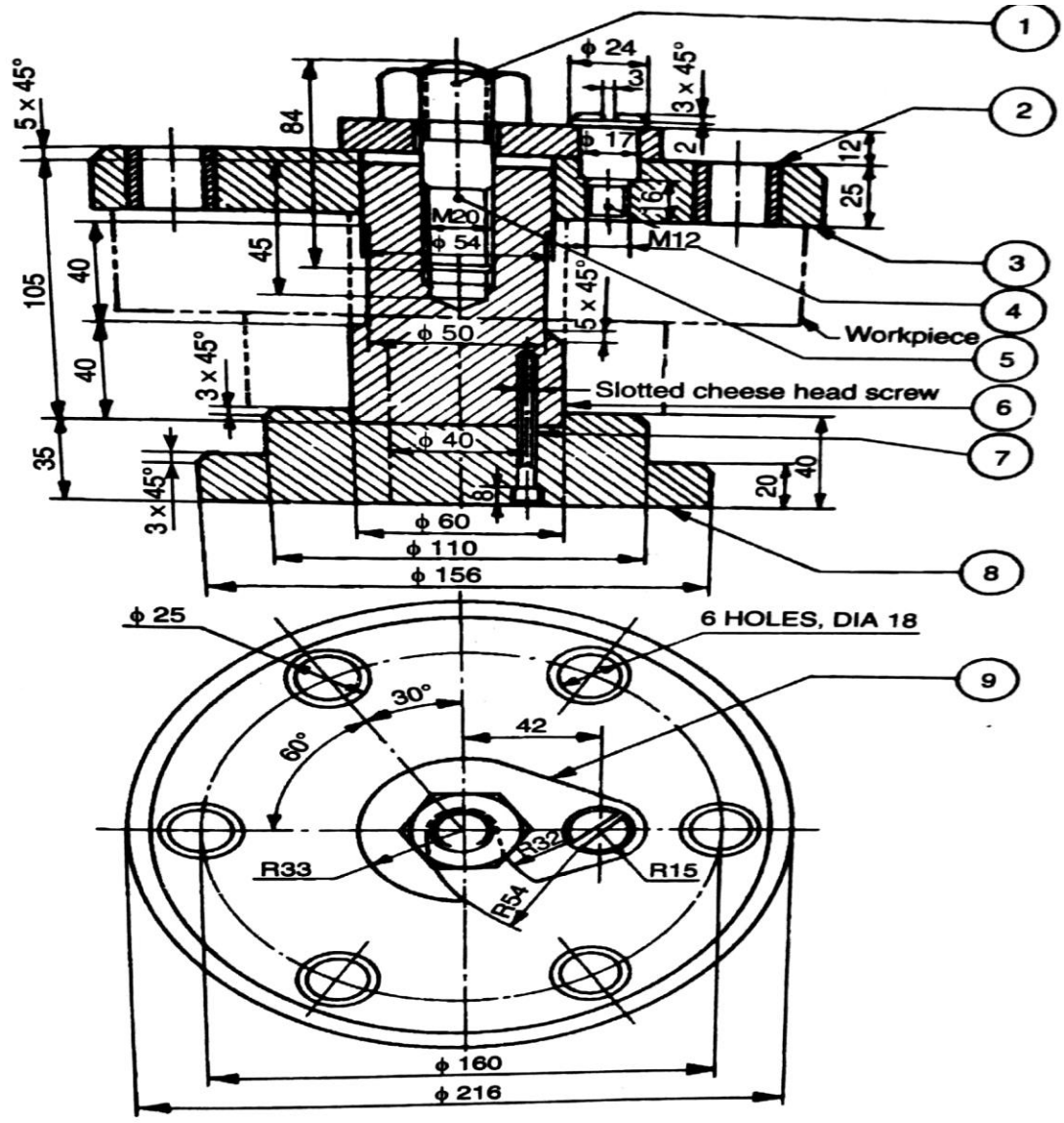
Material : Cast Iron

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the size of raw material	Vernier calipers			
10	Lathe	Clamp the component on chuck and perform step turning of ϕ 80 × 4 mm along with facing	Turning tool and Facing tool			
15	Lathe	Facing ϕ 120 mm side	Facing tool			
20	Lathe	Reverse the component and perform step turning of ϕ 74 × 5 mm along with facing on other side.	Turning tool and Facing tool			
25	Lathe	Boring ϕ 60 mm hole and producing serrations.	Boring tool			
30	Drilling machine	Clamp the component on drill jig and drill 6 holes of ϕ 6 mm	Drill bit			
35		Check the size of finished component	Vernier calipers			

Q7). Draw the part drawings for the given assembly of Drill JIG and suggest the fits between mating parts.

A) Stem and Jig Plate B) Jig Plate and Bush C) Stem and Base Plate.

B) Prepare the process sheet for JIG PLATE.



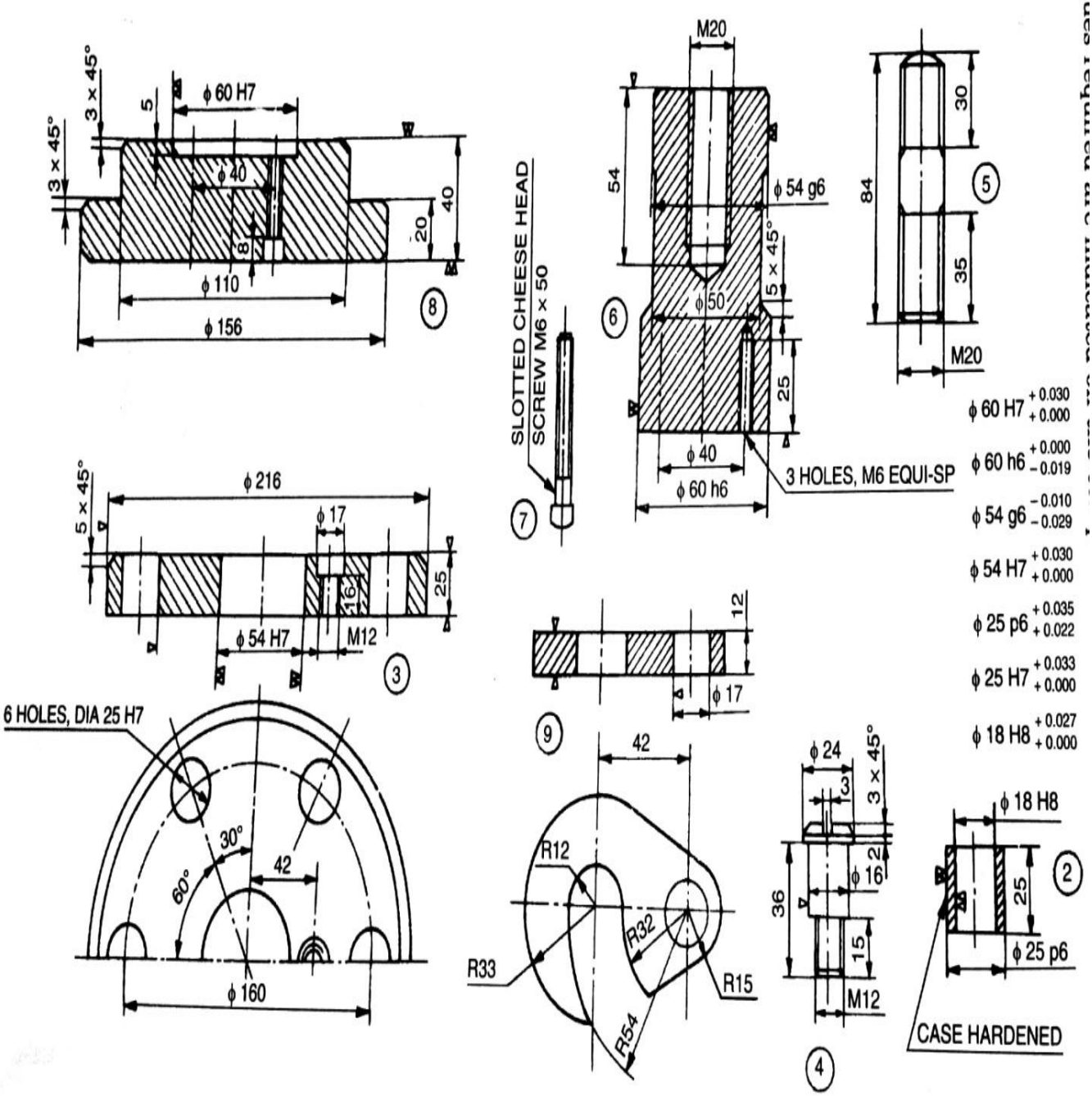
Parts List

Part No.	Qty.	Name	Matl.
1	1	Nut	—
2	6	Bush	MCS
3	1	Jig plate	CI
4	1	Screw	MS
5	1	Stud	MS

Part No.	Qty.	Name	Matl.
6	1	Stem	MS
7	3	Screw	MS
8	1	Base	CI
9	1	Latch washer	MS

Fig. 11.13 Drill jig (Plate type)

7ANS)


3 × 45°
3 × 45°
5
ϕ 60 H7
ϕ 40
8
20
40
ϕ 110
ϕ 156
8
M20
54
ϕ 54 g6
5 × 45°
ϕ 50
25
ϕ 40
ϕ 60 h6
3 HOLES, M6 EQUI-SP
6
SLOTTED CHEESE HEAD
SCREW M6 × 50
7
84
30
35
M20
5
ϕ 60 H7 +0.030 +0.000
ϕ 60 h6 +0.000 −0.019
ϕ 54 g6 −0.010 −0.029
ϕ 54 H7 +0.030 +0.000
ϕ 25 p6 +0.035 +0.022
ϕ 25 H7 +0.033 +0.000
ϕ 18 H8 +0.027 +0.000
5 × 45°
ϕ 216
ϕ 17
16
25
ϕ 54 H7
M12
3
12
ϕ 17
9
6 HOLES, DIA 25 H7
30°
60°
42
ϕ 160
42
R12
R33
R32
R15
R54
ϕ 24
3
3 × 45°
2
ϕ 16
36
15
M12
4
ϕ 18 H8
25
ϕ 25 p6
2
CASE HARDENED

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the material size	Vernier calipers			
10	Lathe	Clamp the work on chuck and perform facing at ends of stock ϕ 28 × 200 mm	Facing tool			
15	Lathe	Turn the component to ϕ 25 mm	Turning tool			Tool changing needed
20	Lathe	Parting off 6 pieces of 25 mm length from stock	Parting tool			Tool changing needed
25	Drilling machine	Drill hole of ϕ 18 mm	Drill bit			
30	Drilling machine	Reaming the hole	Reamer			
35	–	Inspect the finished component	Vernier calipers, etc.			

Q8). From the Assembly drawing of petrol engine connecting rod as shown in below figure. Answer the following :

a) Give the fits for the following

i)connecting rod and small end bush

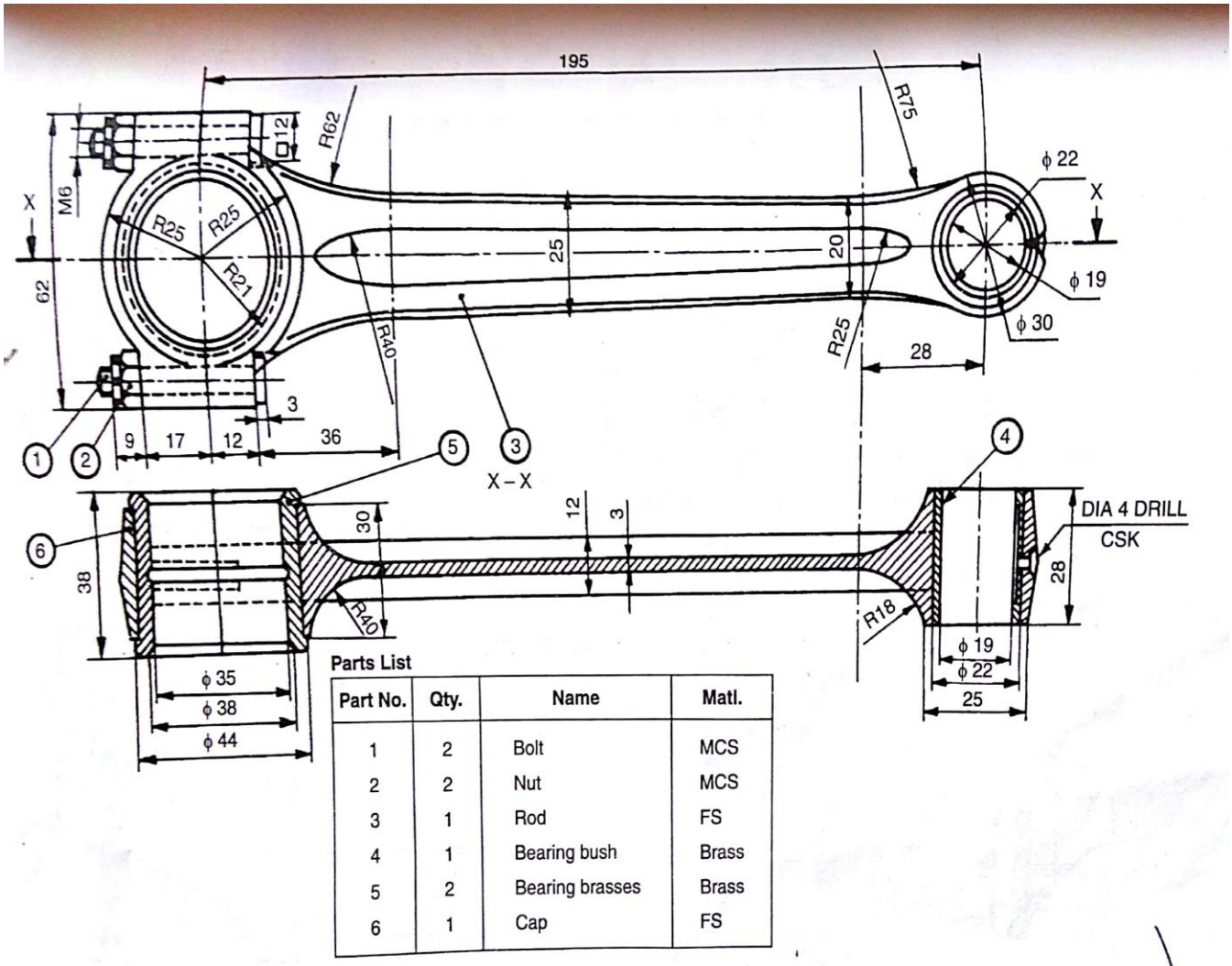
ii)Bearing brasses and connecting rod.

b) Draw the following component drawings and give necessary dimensional and geometric tolerances, surface roughness values and surface treatments.

i)connecting rod ii)Big end cap iii)Bearing brasses

iv)Small end bush v)Big end bolts

c) Give the process sheet for the component bearing bush.

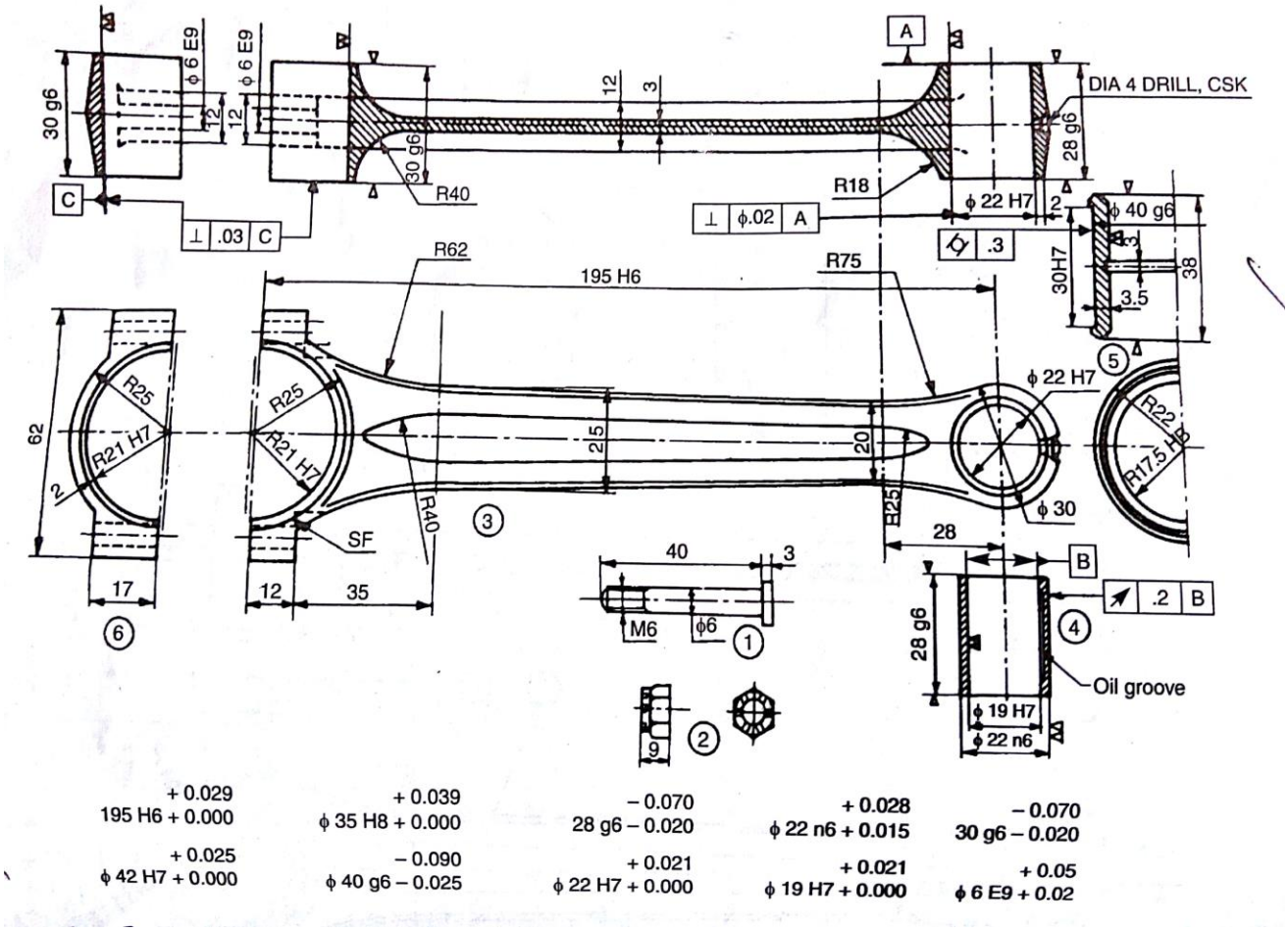


Parts List

Part No.	Qty.	Name	Matl.
1	2	Bolt	MCS
2	2	Nut	MCS
3	1	Rod	FS
4	1	Bearing bush	Brass
5	2	Bearing brasses	Brass
6	1	Cap	FS

Fig. 9.18 Petrol engine connecting rod

8 ANS)



+ 0.029 195 H6 + 0.000	+ 0.039 φ 35 H8 + 0.000	– 0.070 28 g6 – 0.020	+ 0.028 φ 22 n6 + 0.015	– 0.070 30 g6 – 0.020
+ 0.025 φ 42 H7 + 0.000	– 0.090 φ 40 g6 – 0.025	+ 0.021 φ 22 H7 + 0.000	+ 0.021 φ 19 H7 + 0.000	+ 0.05 φ 6 E9 + 0.02

Process Sheet

Part Name : Bearing Bush
Part Number : 4
Cycle Time :
Material : Phosphor Bronze

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the material size	Vernier calipers			
10	Lathe	Clamp the work on chuck and perform facing at end.	Facing tool			
15	Lathe	Turn the work to ϕ 22 × 29 mm	Turning tool			Tool changing needed
20	Lathe	Facing at other end	Facing tool			Tool changing needed
25	Drilling machine	Clamp the work on drill jig and drill a hole ϕ 4 mm	Drill bit			
30	Drilling machine	Drill a hole of ϕ 18 mm	Drill bit			Tool changing needed
35	Drilling machine	Reaming drilled hole of ϕ 18 mm to ϕ 19 mm	Reamer			Tool changing needed
40	–	Inspect the finished component	Vernier calipers, etc.			

Q9). From the Assembly drawing of Tail Stock answer the following

A)Give the fits for the following:

i)Barrel and spindle

ii)Hand Wheel and key

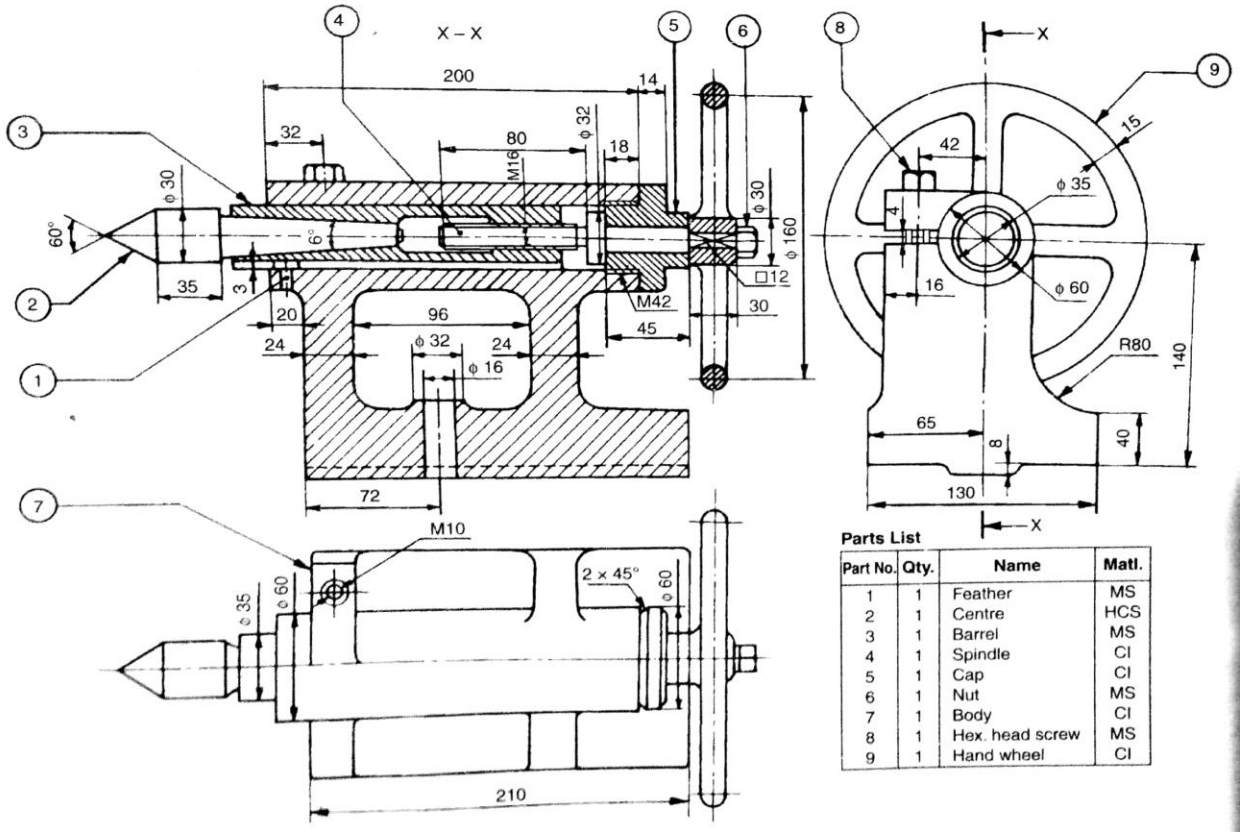
iii)Body and Barrel

B)Draw the following components drawings and give necessary dimensional and geometic tolerances, surface roughness values.

i)Body ii)Spindle Bearing

iii)Hand Wheel iv)Centre

C) Give the process sheet for the Barrel.

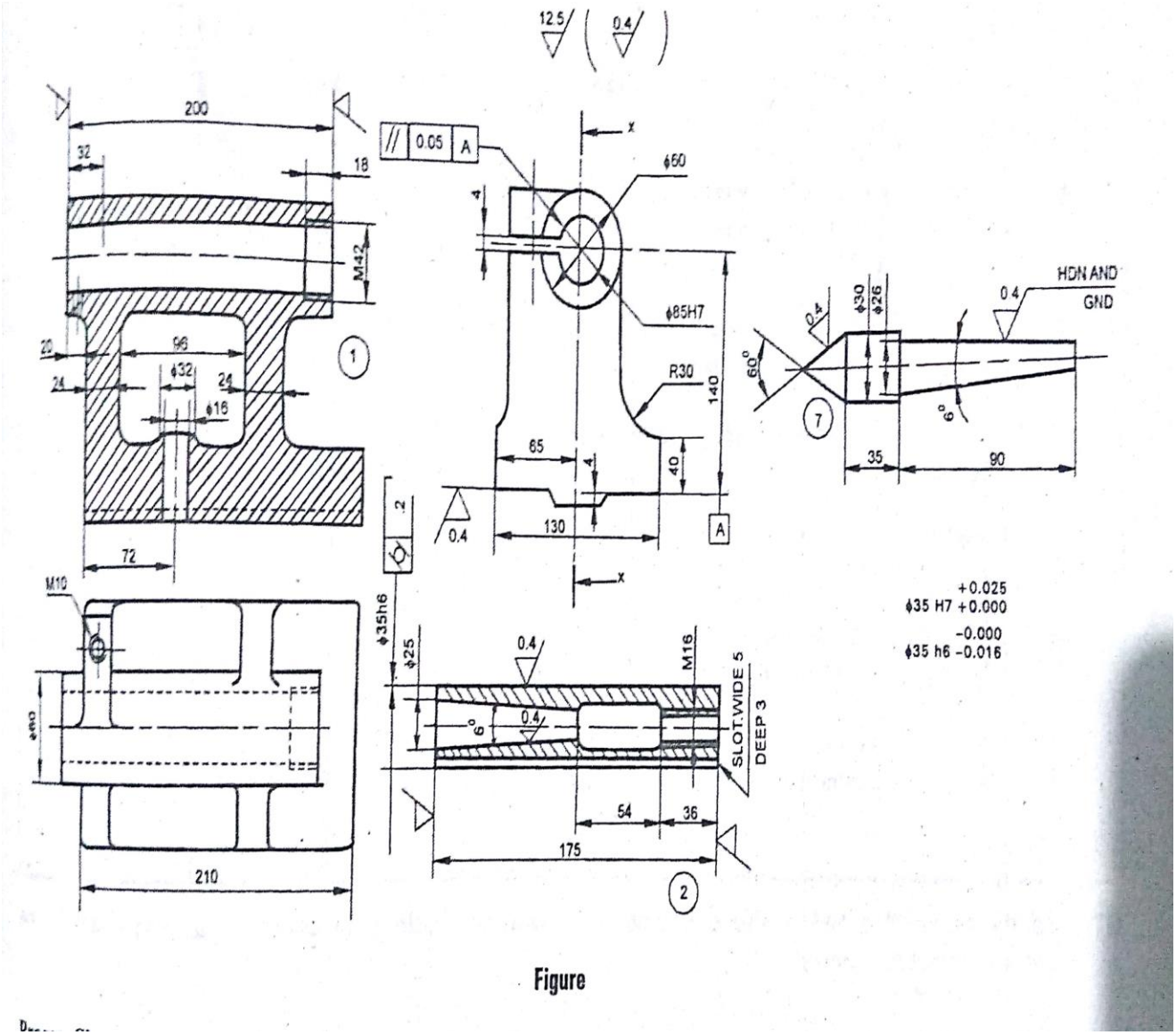


Parts List

Part No.	Qty.	Name	Matl.
1	1	Feather	MS
2	1	Centre	HCS
3	1	Barrel	MS
4	1	Spindle	CI
5	1	Cap	CI
6	1	Nut	MS
7	1	Body	CI
8	1	Hex. head screw	MS
9	1	Hand wheel	CI

Fig. 9.43 Lathe tail-stock

9 ANS)


12.5
0.4
200
32
18
M42
20
24
96
φ32
24
φ16
72
M10
φ60
0.05
A
x
φ60
4
φ85H7
R30
140
65
4
40
130
0.4
A
x
.2
φ35h6
φ25
0.4
M16
6°
0.4
SLOT.WIDE 5
DEEP 3
54
36
175
210
1
2
φ30
φ26
0.4
HDN AND
GND
60°
6°
7
35
90
+0.025
φ35 H7 +0.000
-0.000
φ35 h6 -0.016

Figure

Figure

Process Sheet

Part Name : Barrel

Part Number : 2

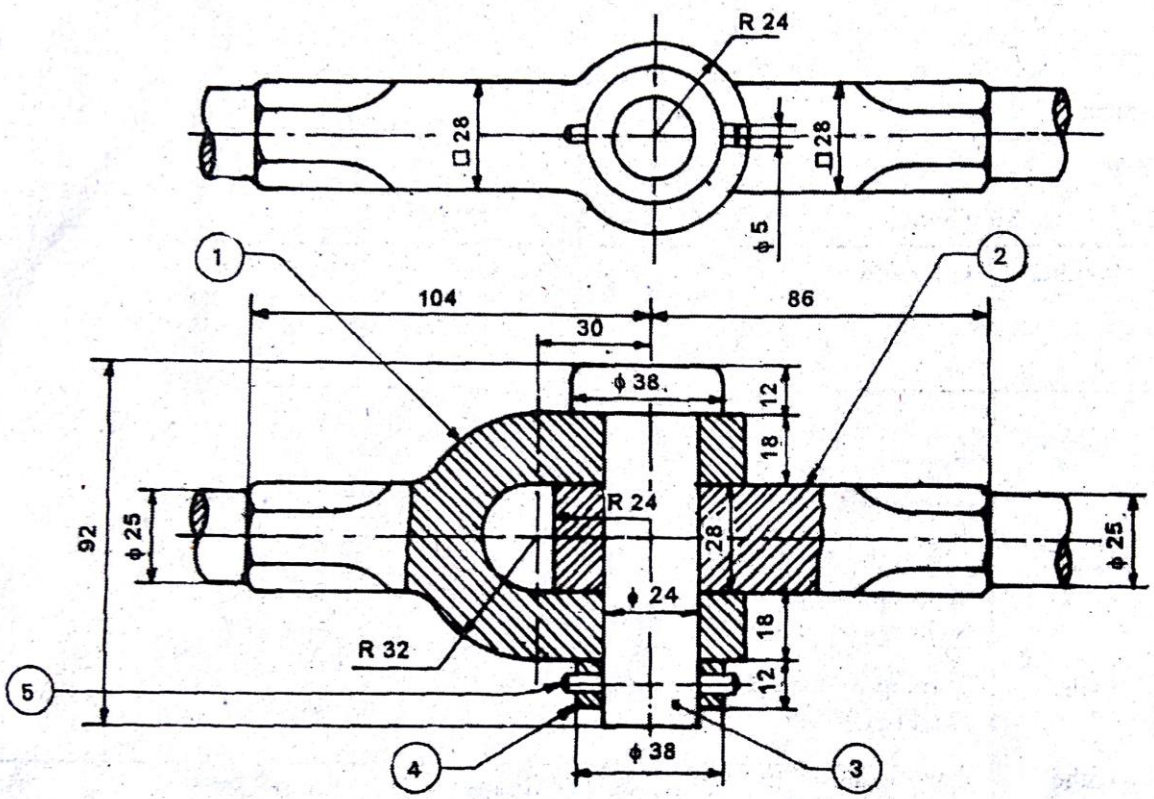
Cycle Time :

Material : Mild Steel

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the size of component	Vernier calipers			
10	Lathe	Clamp the component on chuck and perform facing	Facing tool			
15	Lathe	Centre drilling	Centre drill bit			
20	Lathe	Mount the component between centres and turn the component to ϕ 35 mm and upto the complete length.	Turning tool			
25	Lathe	Clamp the component on the chuck and drill hole upto the complete length	Drill bit			
30	Lathe	Boring the inner cavity or recess.	Boring tool			
35	Lathe	Threading M16	Threading tool or tap			
40	Lathe	Reverse the component and perform facing at other end.	Facing tool			
45	Lathe	Boring the tapered hollow portion or morse taper	Boring bar			
50	Centreless grinder	Grinding the outer surface	–			
55	Milling	Slot cutting	Slitting saw type cutter			
60	Cylindrical grinder	Grinding the tapered hollow portion	–			
65		Check the size of finished component	Vernier calipers and other suitable measuring instruments			

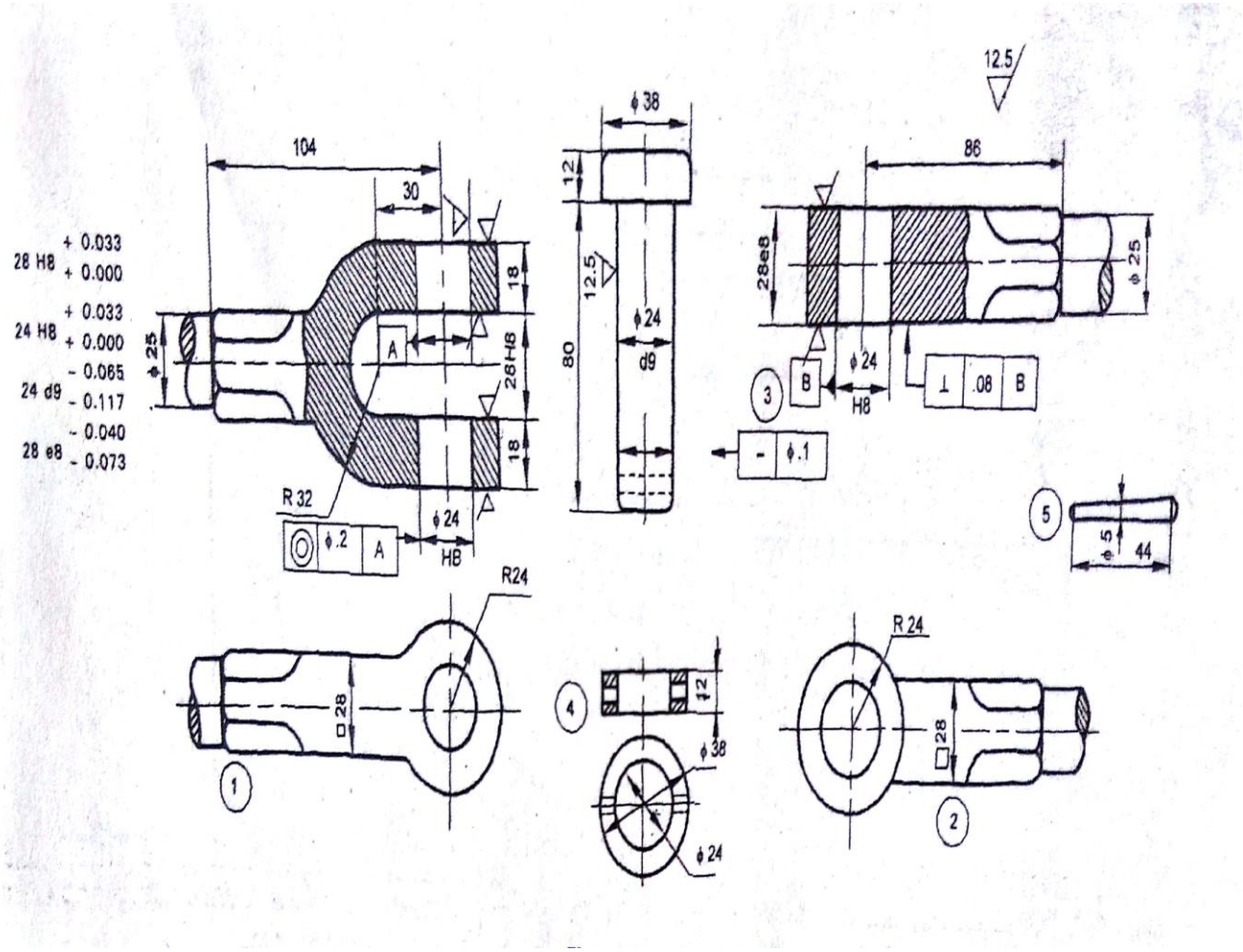
Q10).Study the given assembly drawing of the knuckle joint as shown in below figure.

a) **Draw the component drawings.**
b) **Apply suitable tolerances and fits.**
c) **Apply suitable geometrical tolerances to components.**
d) **Show the surface roughness symbols.**
e) **Prepare the process sheet for PIN.**



Part No.	Name	Material	Qty.
1.	Fork end	FS – Forging	1
2.	Eye end	FS – Forging	1
3.	Pin	MS – ϕ40 × 95	1
4.	Collar	MS – ϕ40 Bar stock	1
5.	Taper pin	MS – Std. component	1

10 ANS)


28 H8 + 0.033 + 0.000
24 H8 + 0.033 + 0.000
24 d9 - 0.065 - 0.117
28 e8 - 0.040 - 0.073
104
30
18
28H8
18
ϕ25
A
R 32
ϕ.2 A
ϕ24
H8
ϕ38
12
12.5
80
ϕ24
d9
12.5
86
28e8
ϕ25
B
ϕ24
H8
⊥ .08 B
- ϕ.1
3
5
ϕ5
44
R24
□28
1
4
12
ϕ38
ϕ24
R 24
□28
2

Process Sheet

Part Name : Pin

Part Number : 3

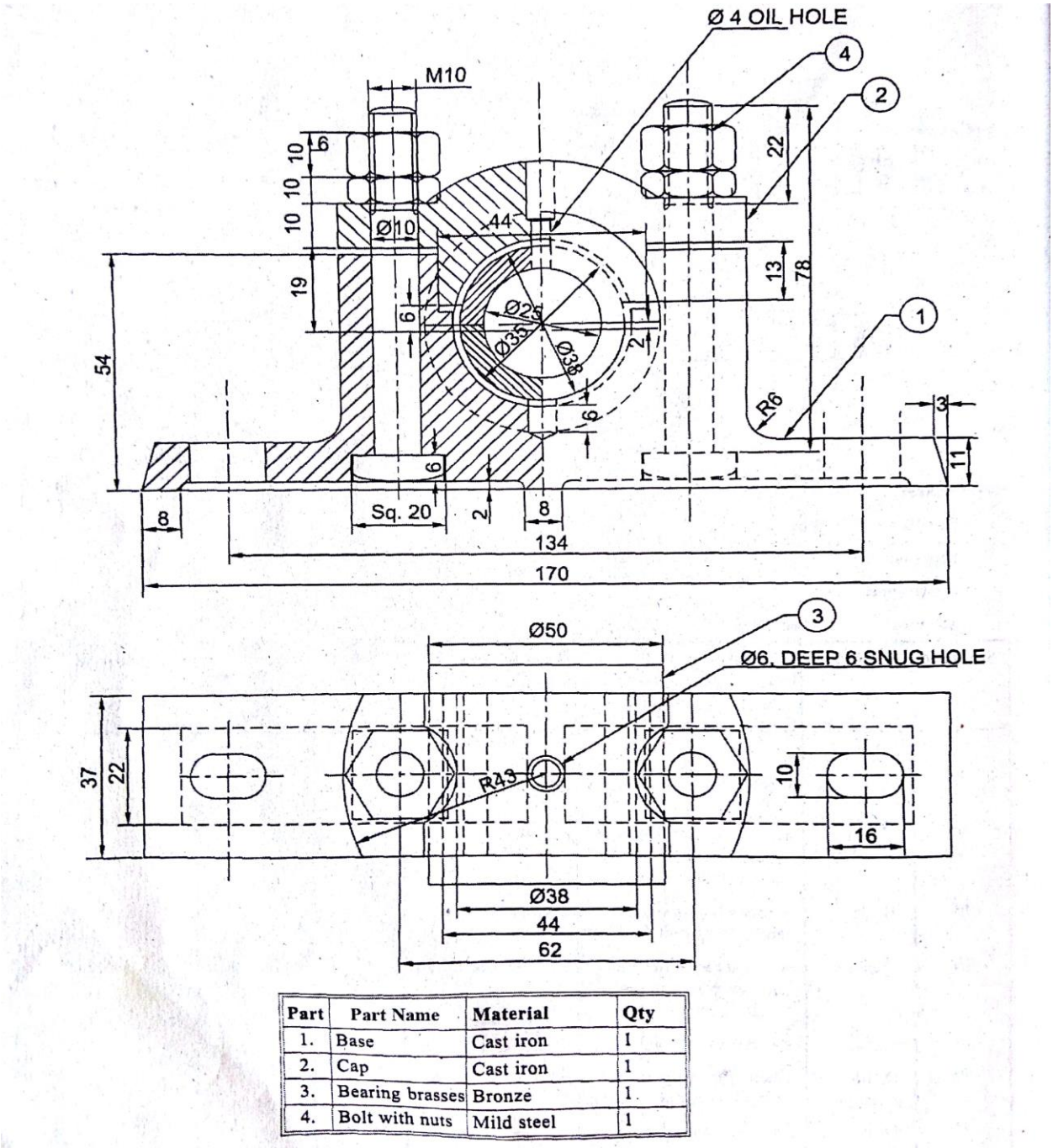
Cycle Time :

Material : Mild Steel

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the size of component	Vernier calipers			
10	Lathe	Clamp the component on chuck and perform facing at the end	Facing tool			
15	Lathe	Turning ϕ 24 mm upto a length of 80 mm	Turning tool			
20	Lathe	Reverse the component and turn ϕ 38 mm upto a length of 12 mm	Turning tool			
25	Lathe	Facing at other end	Facing tool			
30	Drilling machine	Clamp the component on drill jig and drill a hole	Drill bit of ϕ 4 mm			
35	Drilling machine	Taper reaming of hole to ϕ 5 mm	Reamer			
40		Check the size of finished component	Vernier calipers			

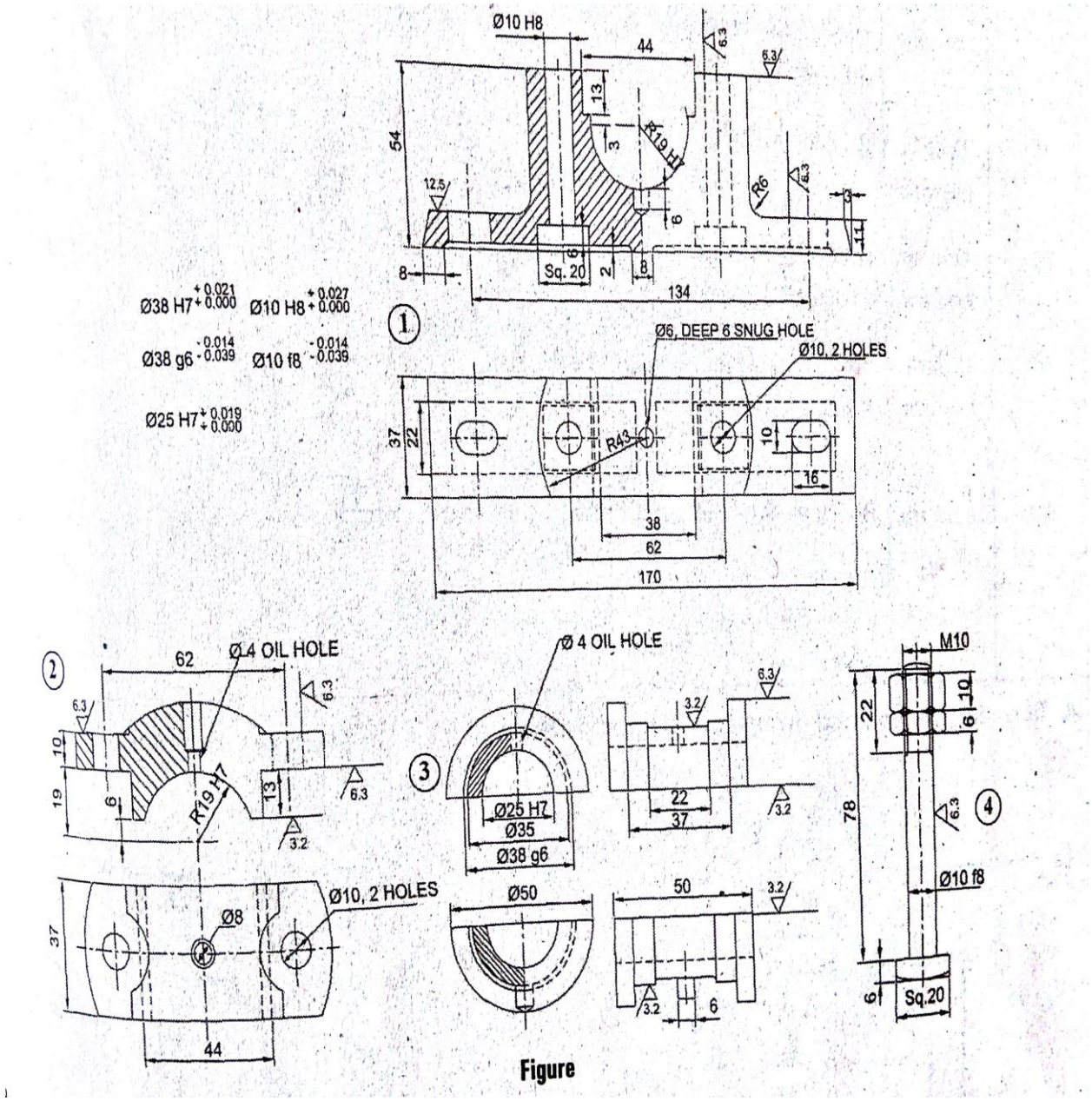
Q11). Study the given assembly drawing of the Plummer Block as shown in below figure.

a) **Draw the component drawings.**
b) **Apply suitable tolerances and fits.**
c) **Apply suitable geometrical tolerances to components.**
d) **Show the surface roughness symbols.**
e) **Prepare the process sheet for Cap.**



Part	Part Name	Material	Qty
1.	Base	Cast iron	1
2.	Cap	Cast iron	1
3.	Bearing brasses	Bronze	1
4.	Bolt with nuts	Mild steel	1

11 ANS)



Figure

Process Sheet

Part Name : Cap

Part Number : 2

Cycle Time :

Material : Cast Iron

Sequence	Machine	Operation	Tools or Gauges	Cycle Time		Remarks
				Setup Time	Operation Time	
05	–	Check the casting size	Vernier calipers			
10	Milling	Clamp the work on milling machine and perform facing on both the upper sides of work i.e., 37 × 21 mm sections	Face milling cutter			
15	Milling	Facing on bottom sides of work i.e., 13 × 21 mm sections	Face milling cutter			
20	Milling	Facing the sides of work to 37 mm	Slab milling cutter			Tool changing needed
25	Drilling machine	Clamp the work on drill jig and drill two holes of ϕ 10 mm	Drill bit			
30	Drilling machine	Reaming the holes	Reamer			Tool changing needed
35	Drilling machine	Drill an oil hole of ϕ 4 mm at centre	Drill bit			Tool changing needed
40	Drilling machine	Counter boring the oil hole to ϕ 8 mm upto a length of 13 mm	Boring tool			Tool changing needed
45	Jig boring machine	Boring the R19 mm section	Single point cutting tool			
50	–	Inspect the finished component	Vernier calipers, etc			