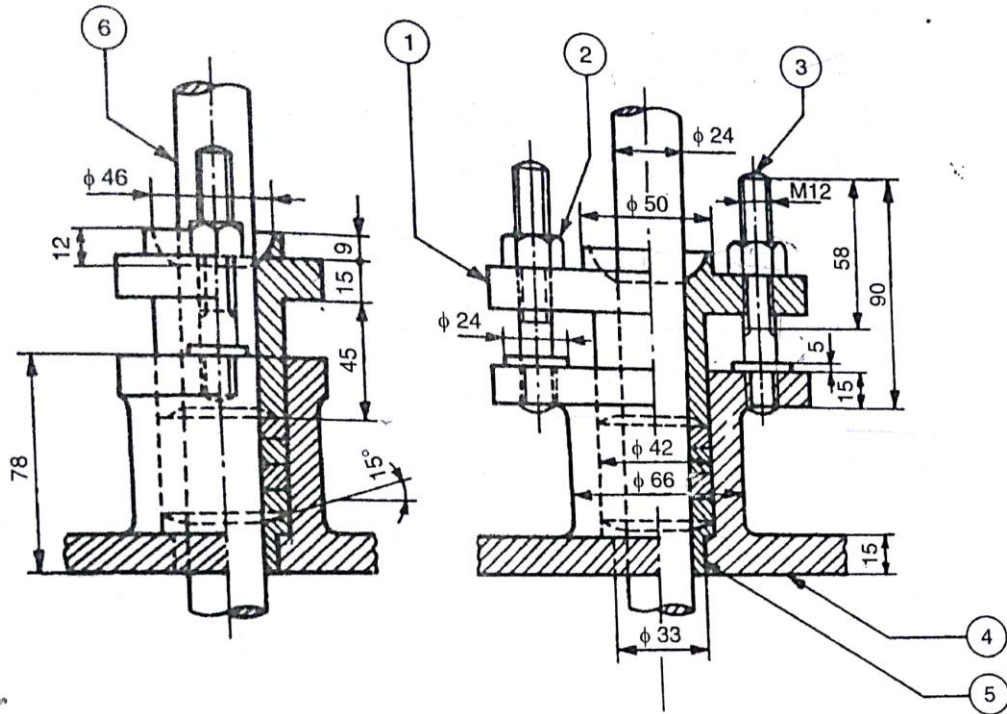


Q1). Study the given assembly drawing of the Stuffing Box as shown in below figure.

- 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

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 $\phi 50 \times 9$ mm and perform facing on the end and oval section of gland.	Facing tool			
15	Lathe	Turn the component $\phi 42 \times 45$ mm	Turning tool			
20	Lathe	Drill $\phi 20$ mm hole	Drill bit			
25	Lathe	Bore the hole upto $\phi 24$ 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 $\phi 50$ mm	Turning tool			
50	Lathe	Bore R12	Boring tool			
55	Drilling machine	Drill two holes of $\phi 13$ mm	Drill jig			
60	—	Inspect and verify the component size	Outside micrometer, vernier caliper, etc.			

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 \times 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 vernier caliper			

Q3) From the Given assemble drawing answer the following

a) Give the fits for the following.

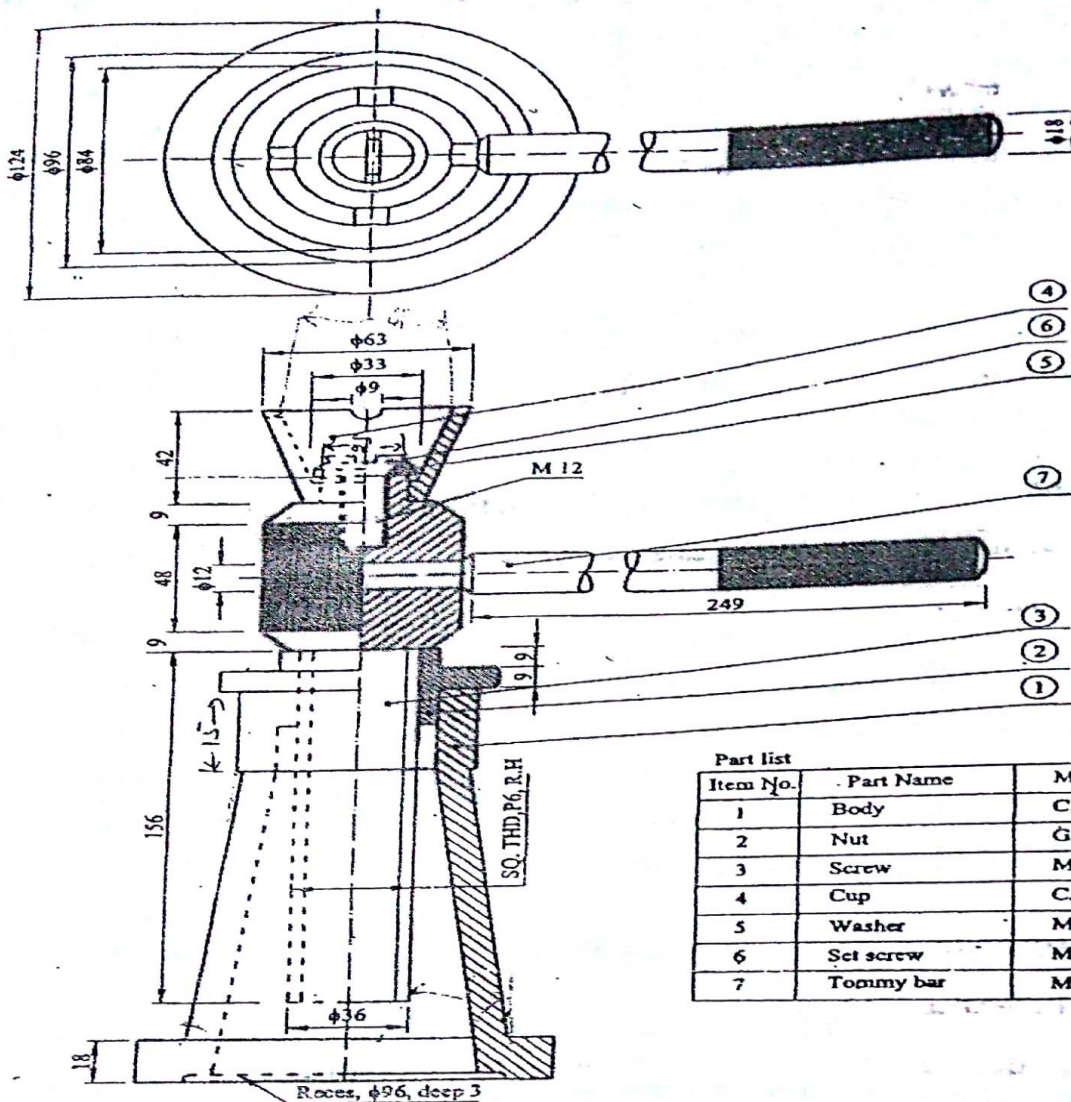
- i) Nut and Screw**
- ii) Tommy bar and Screw**
- iii) Body and Nut**

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**

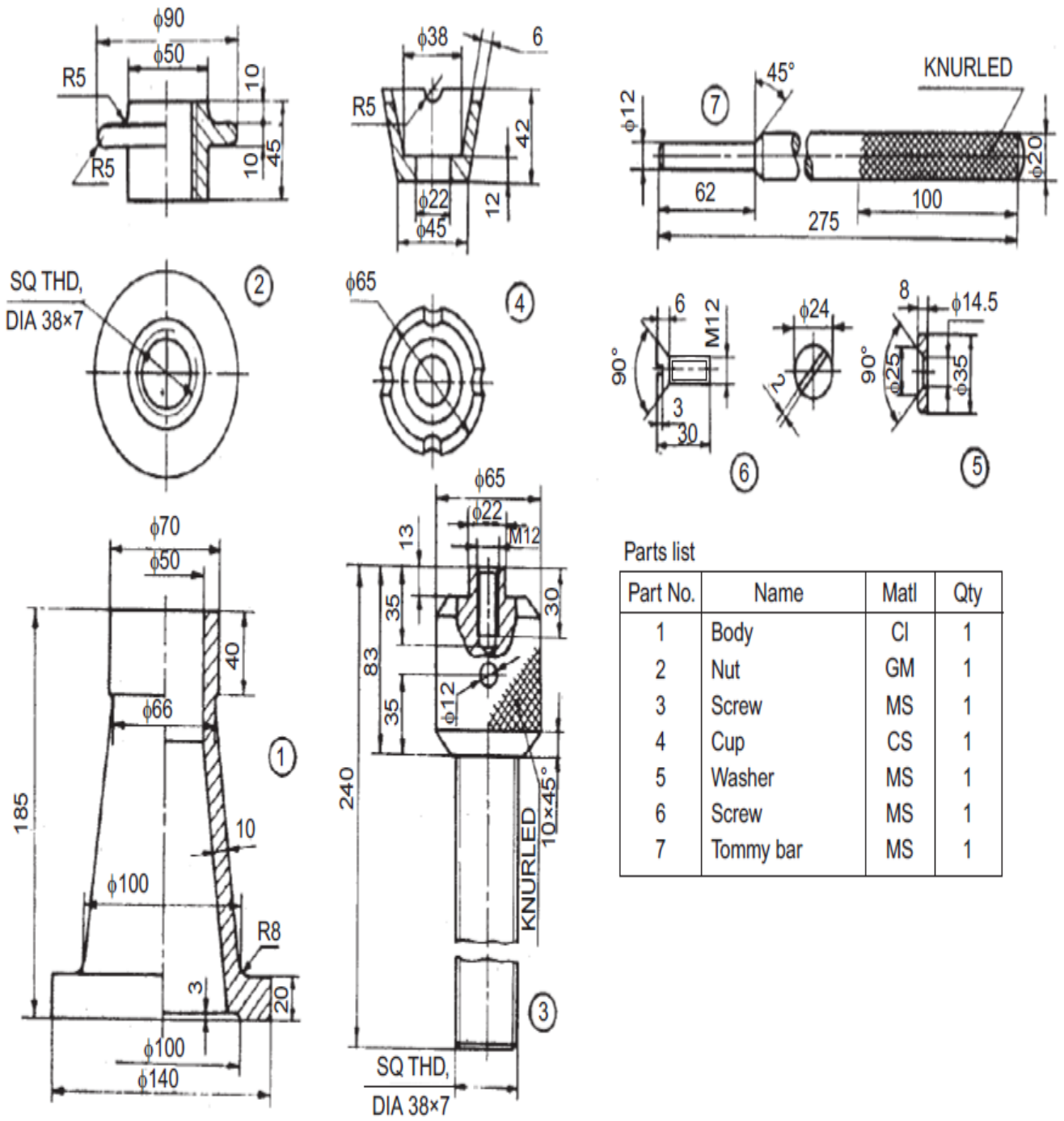
c) Give the process sheet for the Screw and for the tommy bar.

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 \times 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

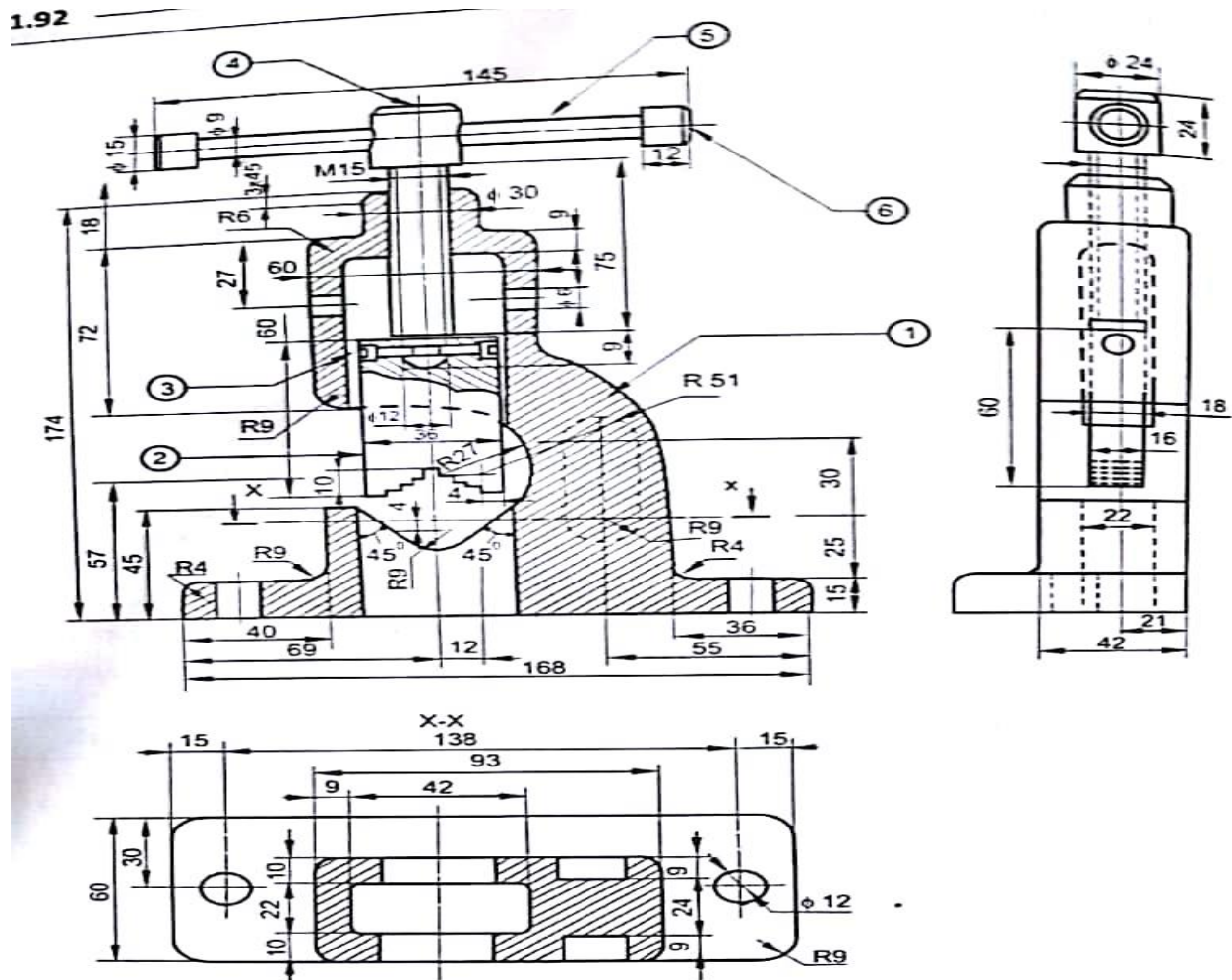
Part Name : Screw
 Part Number : 2
 Cycle Time :
 Material : Medium Carbon Steel

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 ϕ 36 mm, ϕ 60 mm and ϕ 25 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 ϕ 16 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.



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 - $\phi 25$ Bar stock	1
5.	Handle bar	MS - $\phi 12$ Bar stock	1
6.	Handle bar cap	MS - $\phi 16$ Bar stock	2

Fig. 11.30 (a) Pipe Vice

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.**

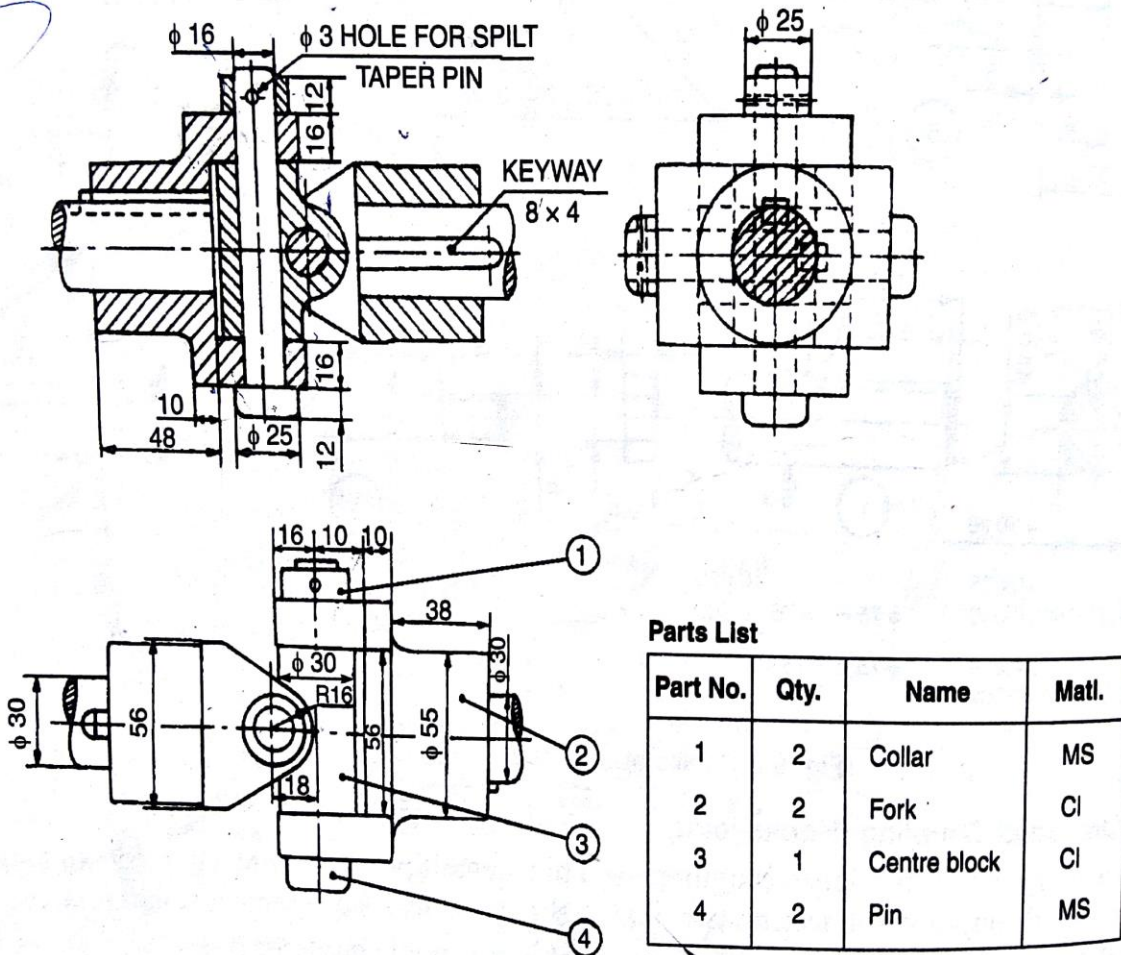


Fig. 9.4 Universal coupling

5ANS)

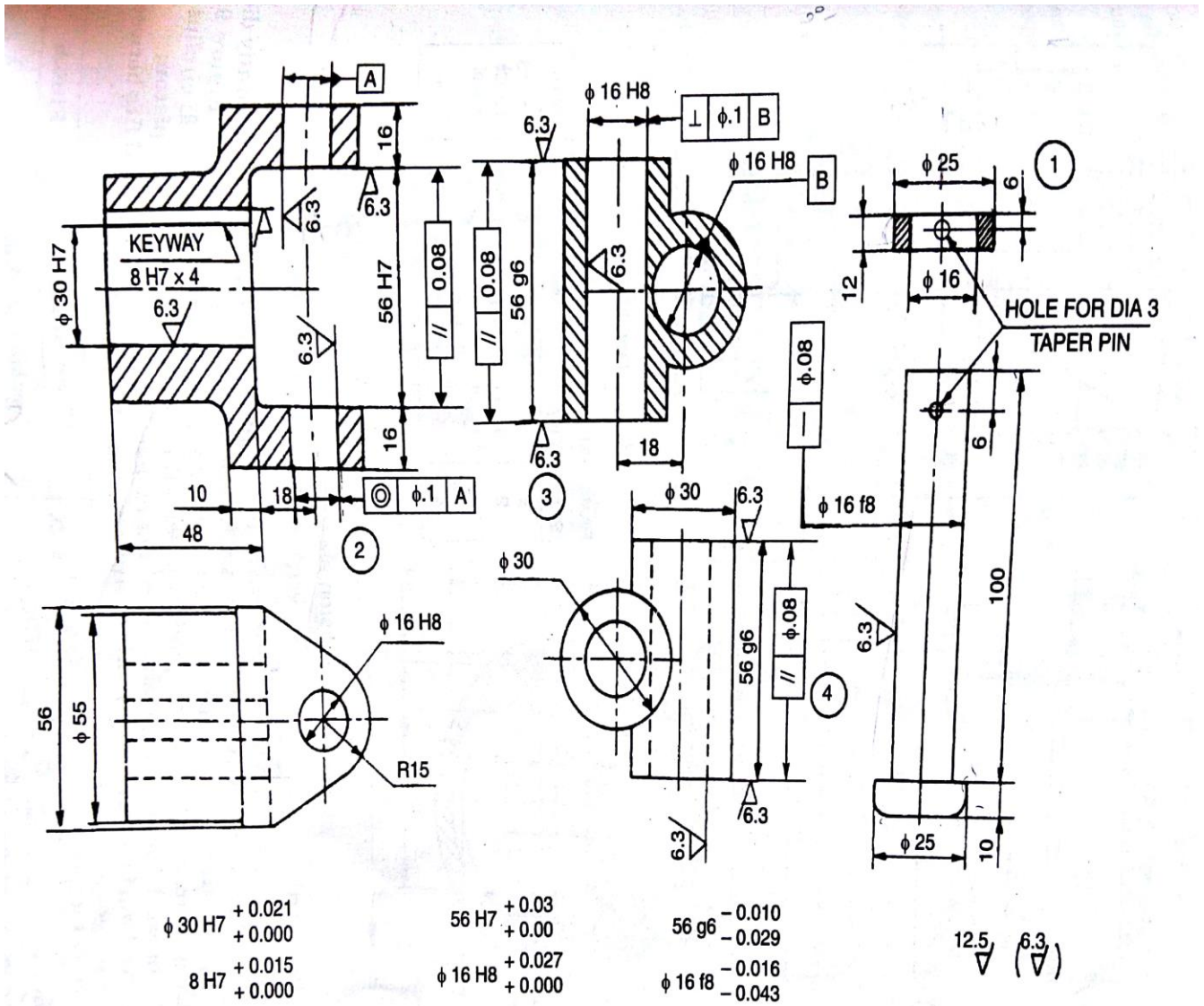


Fig. 9.5 Details of universal coupling

Process Sheet

Part Name : Fork

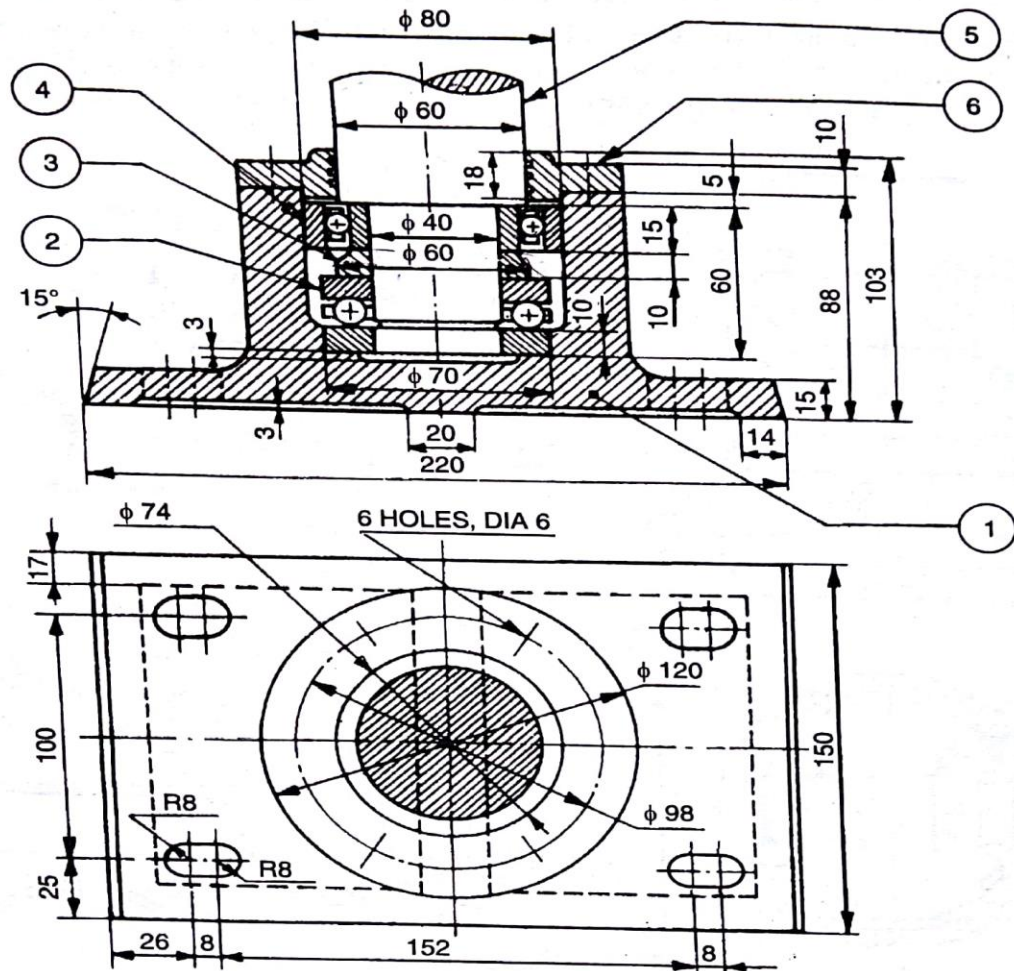
Part Number : 1

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 $\phi 56 \times 38$ mm	Turning tool			Tool changing needed
20	Drilling machine	Clamp the work on drill jig and drill a hole of $\phi 30$ 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 $\phi 16 \times 88$ mm	Drill bit			Tool changing needed
35	Drilling machine	Reaming $\phi 16$ 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.**
- Draw the component drawings.**
 - Apply suitable tolerances and fits.**
 - Apply suitable geometrical tolerances to components.**
 - Show the surface roughness symbols.**
 - Prepare the process sheet for COVER.**

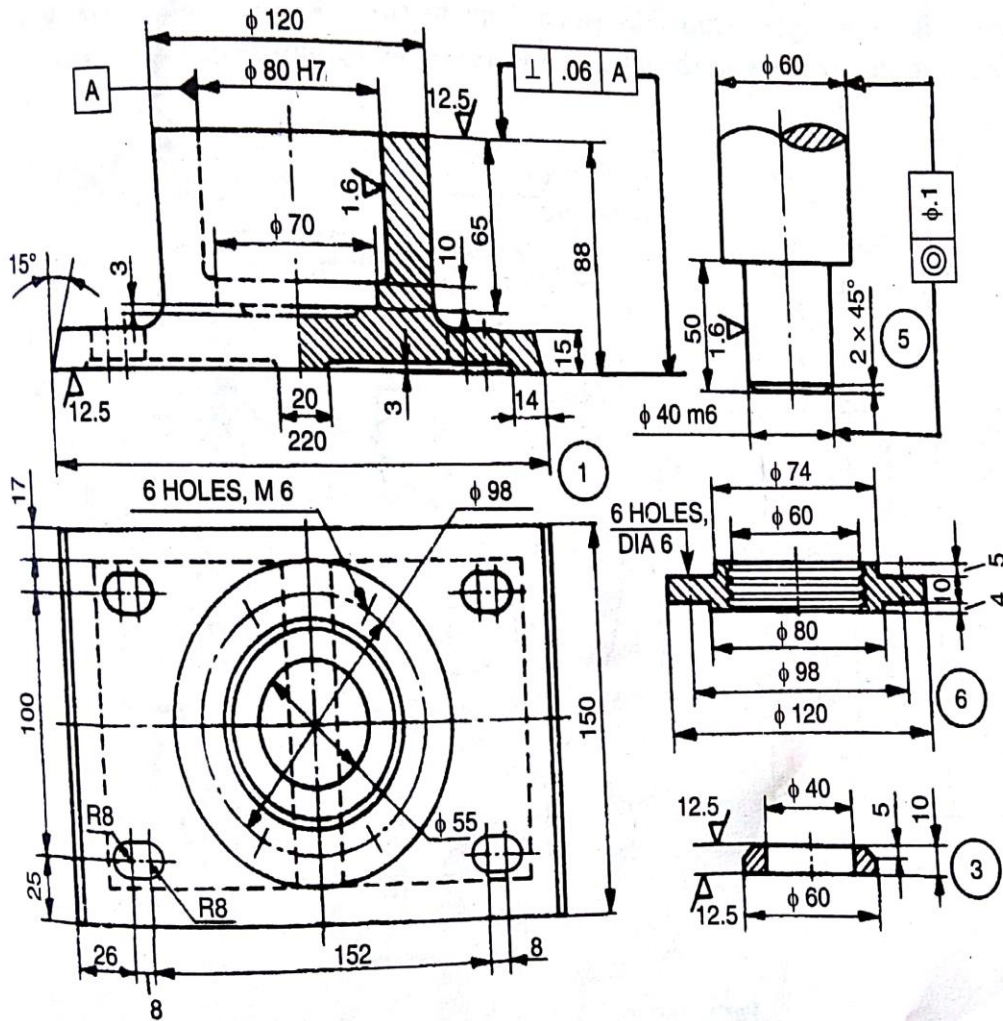


Parts List

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

$\phi 80$ H7 — $80 + 0.030$

$\phi 40$ m6 — $40 + 0.009$

Fig. 9.9 Details of footstep bearing

Com-

Process Sheet

Part Name : Cover

Part Number : 6

Cycle Time :

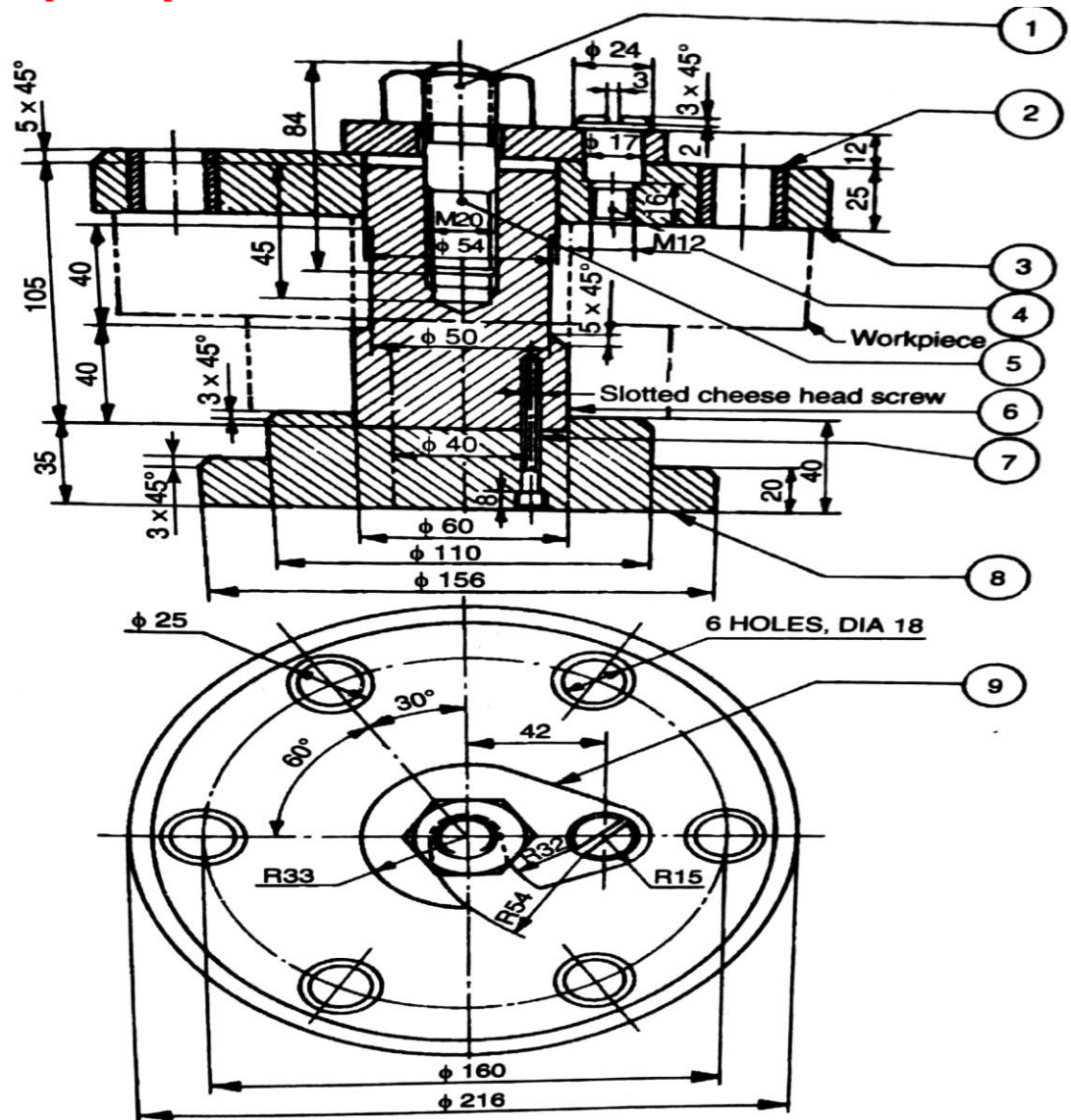
Material : Cast Iron

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 $\phi 80 \times 4$ mm along with facing	Turning tool and Facing tool			
15	Lathe	Facing $\phi 120$ mm side	Facing tool			
20	Lathe	Reverse the component and perform step turning of $\phi 74 \times 5$ mm along with facing on other side.	Turning tool and Facing tool			
25	Lathe	Boring $\phi 60$ mm hole and producing serrations.	Boring tool			
30	Drilling machine	Clamp the component on drill jig and drill 6 holes of $\phi 6$ 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.



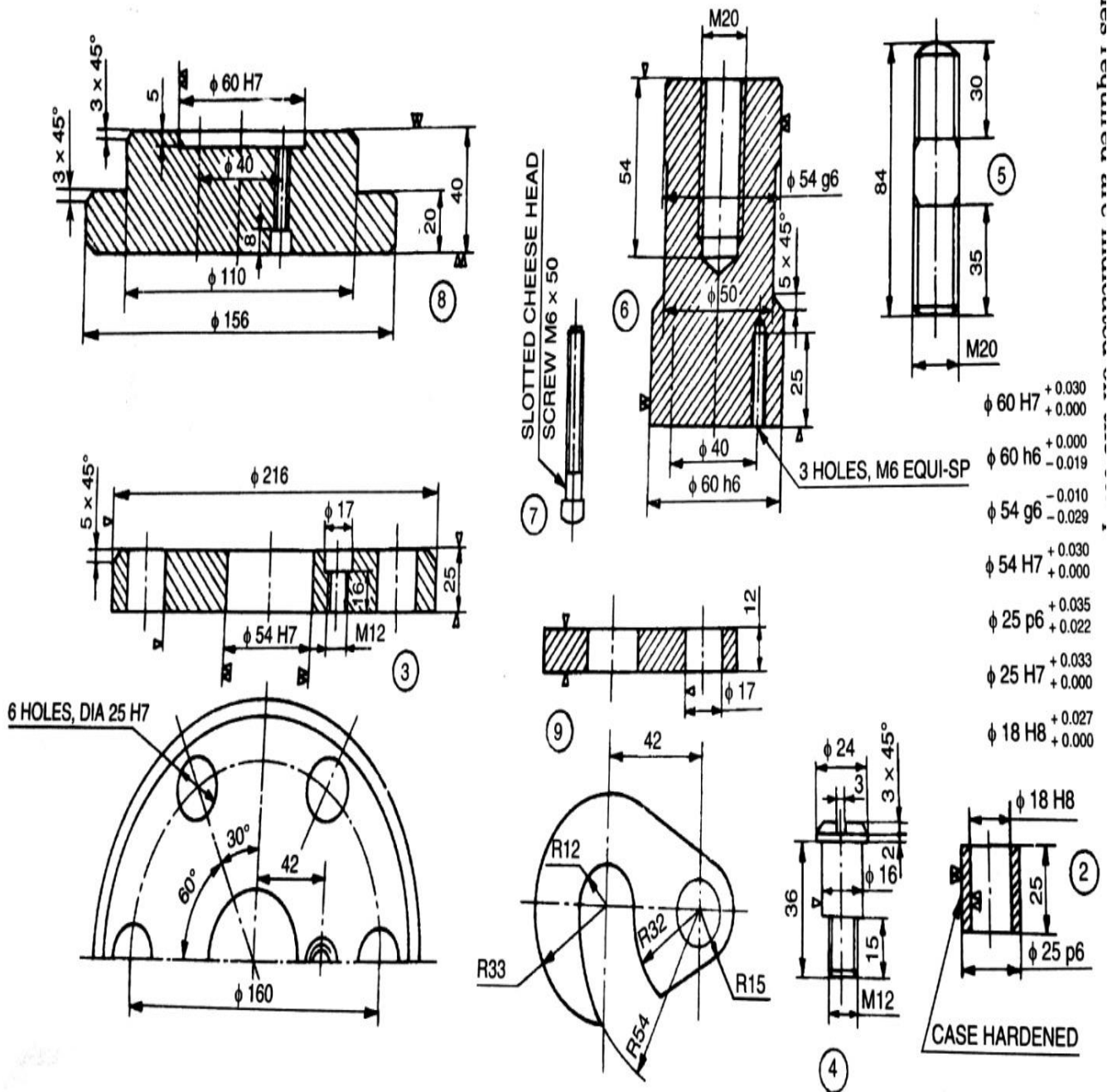
Parts List

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. 11.12 Drill jig (Plate type)

7ANS)



www.civildatas.com

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 $\phi 28 \times 200$ mm	Facing tool			
15	Lathe	Turn the component to $\phi 25$ 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 $\phi 18$ 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.

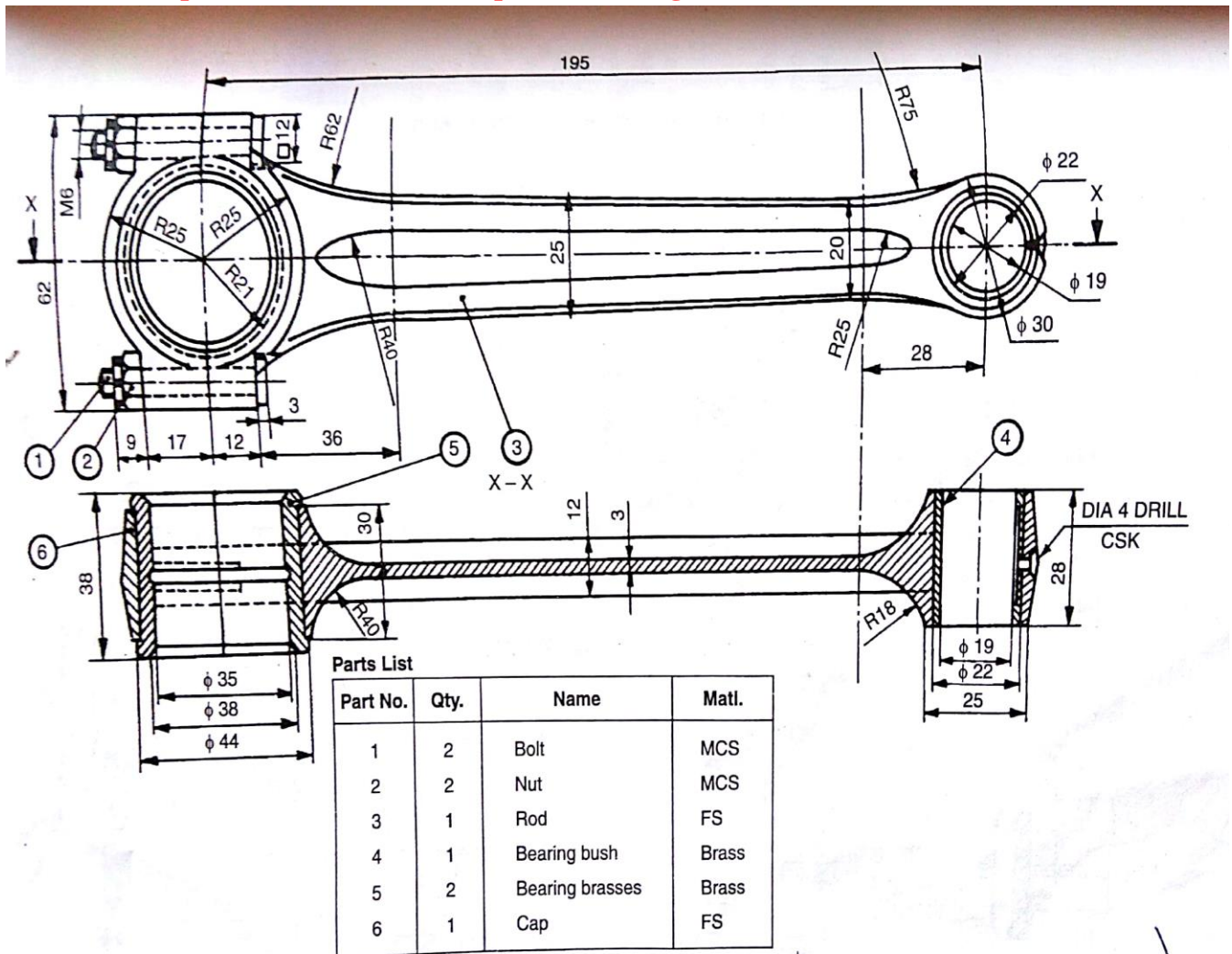
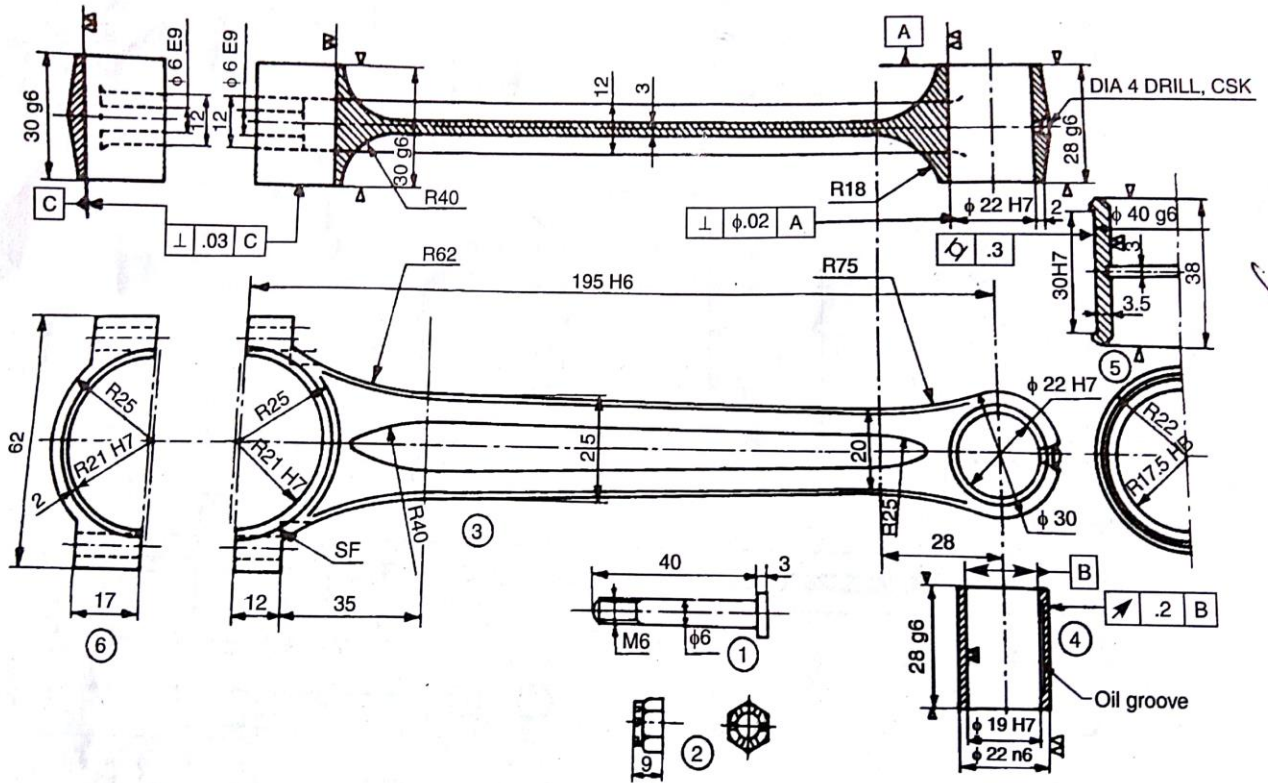


Fig. 9.18 Petrol engine connecting rod

8 ANS)



+ 0.029	+ 0.039	- 0.070	+ 0.028	- 0.070
195 H6 + 0.000	φ 35 H8 + 0.000	28 g6 - 0.020	φ 22 n6 + 0.015	30 g6 - 0.020
+ 0.025	- 0.090	+ 0.021	+ 0.021	+ 0.05
φ 42 H7 + 0.000	φ 40 g6 - 0.025	φ 22 H7 + 0.000	φ 19 H7 + 0.000	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 $\phi 22 \times 29$ 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 $\phi 4$ mm	Drill bit			
30	Drilling machine	Drill a hole of $\phi 18$ mm	Drill bit			Tool changing needed
35	Drilling machine	Reaming drilled hole of $\phi 18$ mm to $\phi 19$ 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 geometric tolerances, surface roughness values.

- i) Body ii) Spindle Bearing**
- iii) Hand Wheel iv) Centre**

C) Give the process sheet for the Barrel.

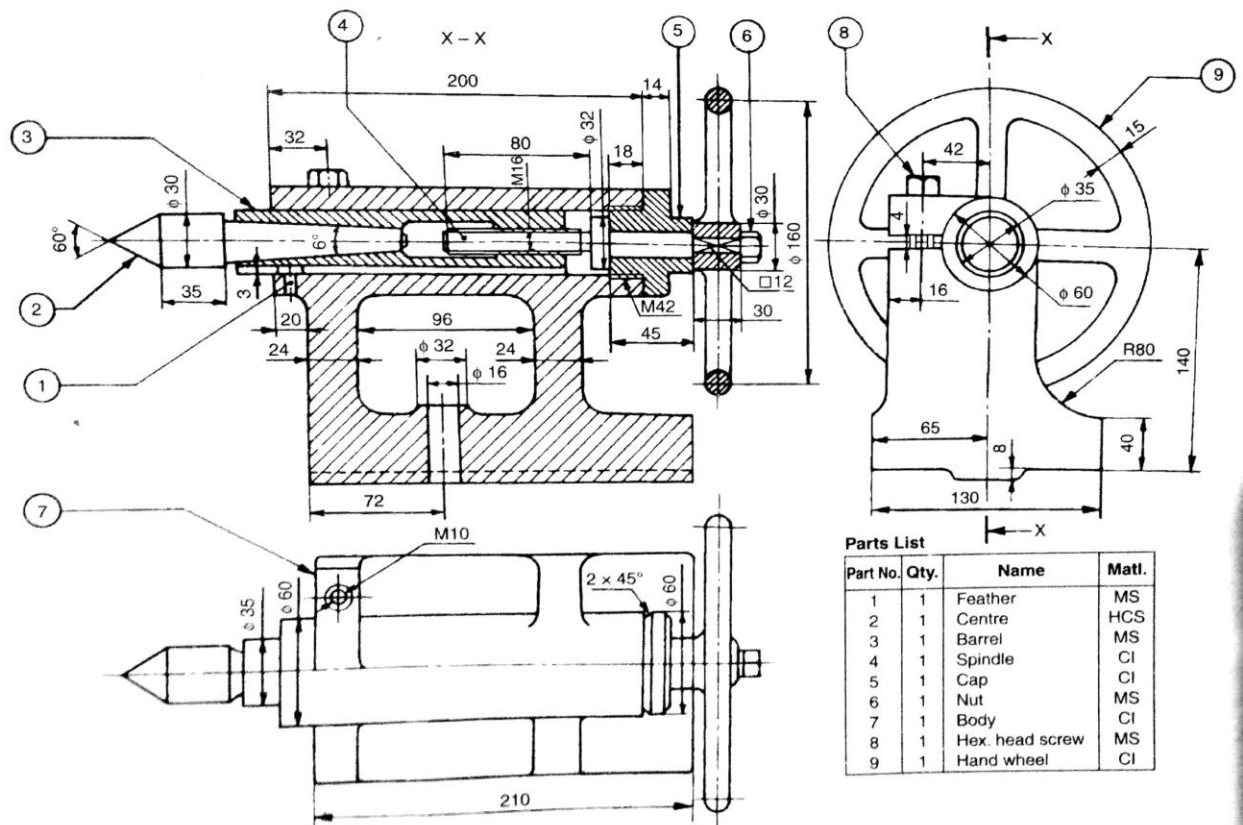
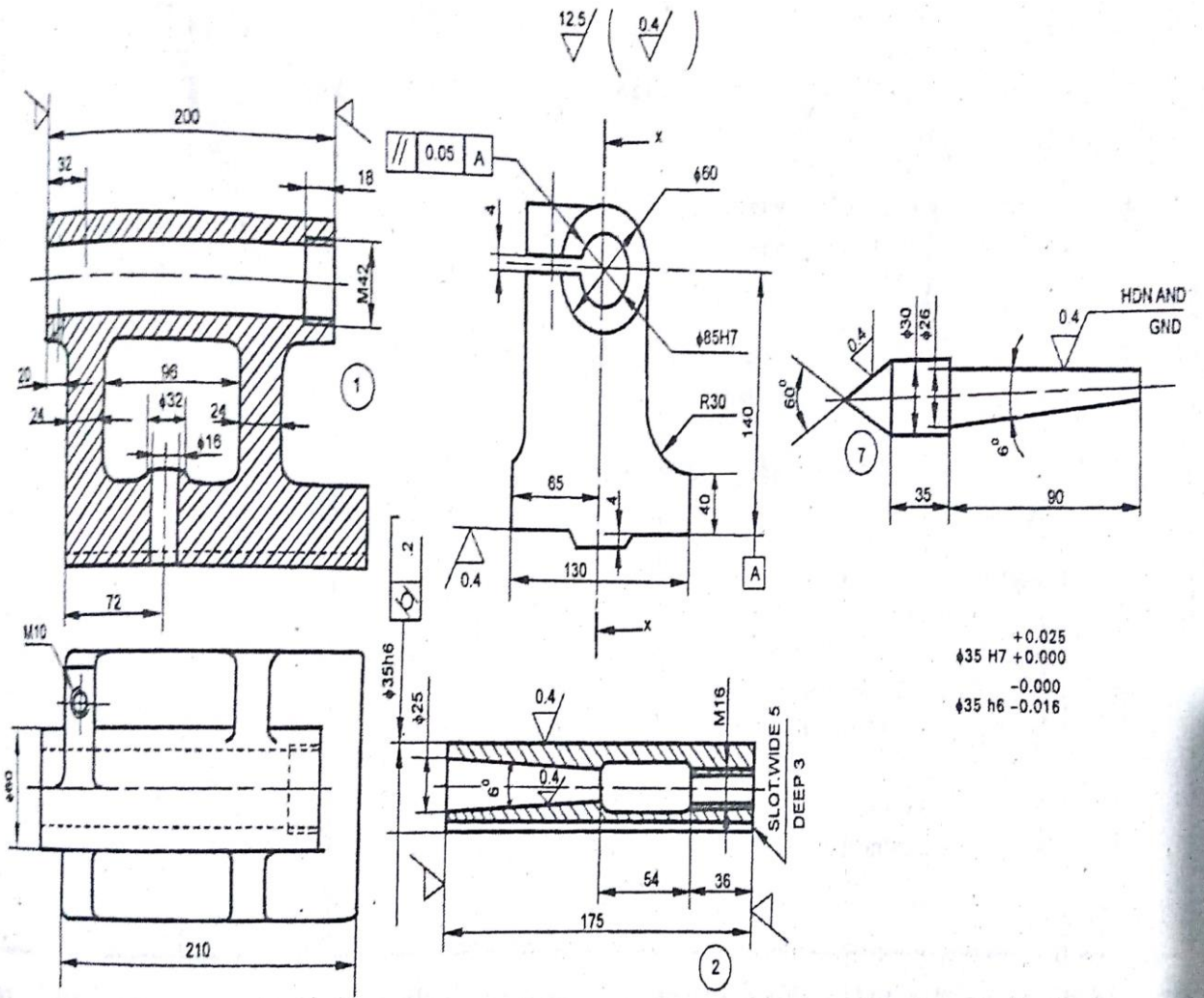


Fig. 9.43 Lathe tail-stock

9 ANS)



Figure

Process Sheet

Figure

Part Name : Barrel

Part Number : 2

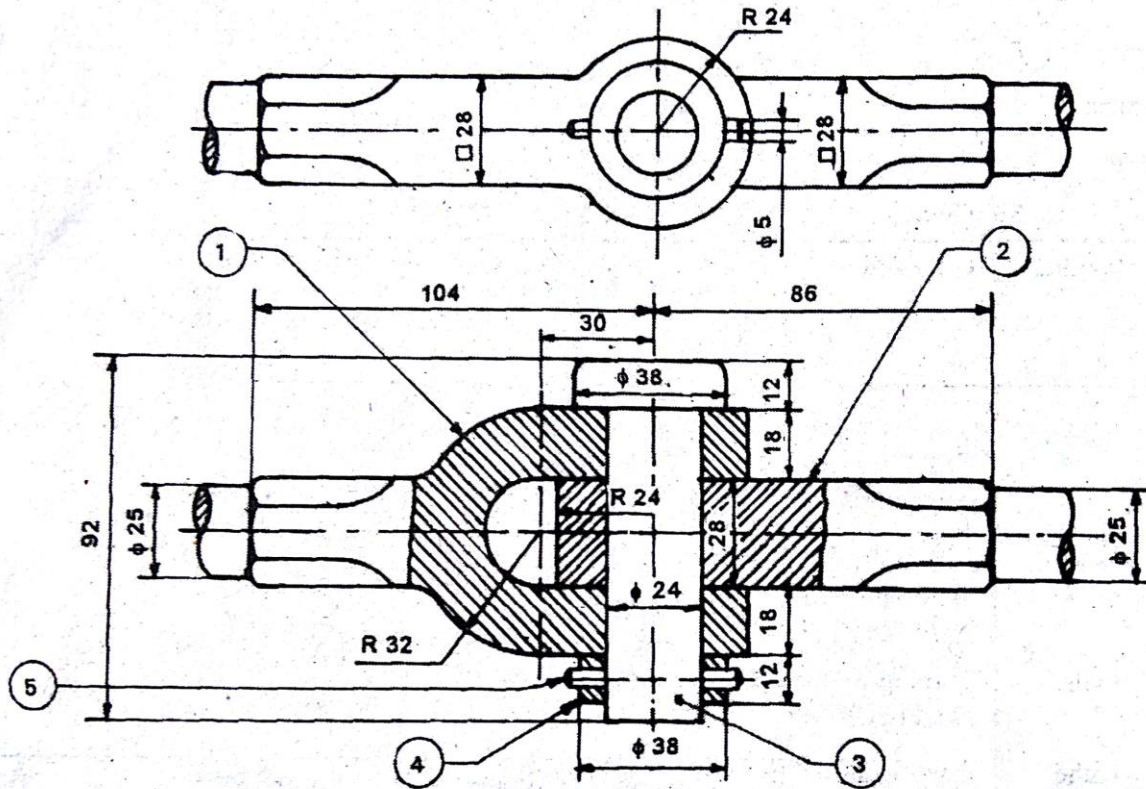
Cycle Time :

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 - $\phi 40 \times 95$	1
4.	Collar	MS - $\phi 40$ Bar stock	1
5.	Taper pin	MS - Std. component	1

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			

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			