CHAPTER 4

ROD JOINTS

4.1 INTRODUCTION

All of you have seen a tractor and its trolley/ trailer. The trolley can be easily joined or removed from the tractor as per the need. Have you ever noticed that how this trolley is joined or detached from the tractor? This work is made so simple by a joint between the tractor and the trolley using a pin or a cotter. There is a fork end at the back of the tractor and an eye end in front of the trolley. A round pin is inserted in between these two to make the joint. In industry also different rod joints are used, some of these we shall learn in the following paragraphs. But first we shall learn about the cotter.

Fig 4.1 (a) Use of Rod Joint

Fig 4.1 (b) Cotter

4.2 COTTER

A cotter is a temporary fastener which is used to connect rigidly two rods, whose axes are collinear and subjected to axial forces only. It is a wedge shaped piece of mild steel block which is uniform in thickness but tapered in width. The tapering is done on one side of the cotter and is usually 1 in 30. The taper on the cotter helps in insertion into the position and its withdrawal. It also helps in the lateral adjustment of the connected parts.

4.3 COTTER JOINT

A joint in which cotter is used to lock two rods together is called cotter joint. Here, we shall study about cotter joints for joining two round rods viz.

(a) Sleeve and cotter joint (using two cotters)

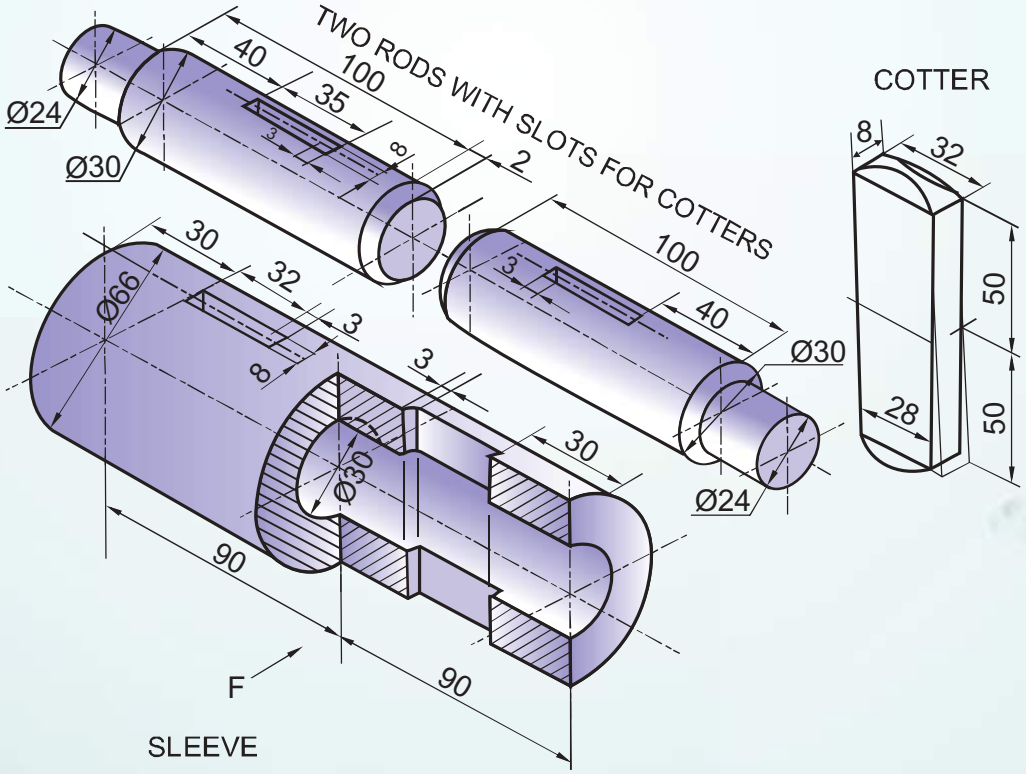
(b) Socket and spigot joint (using one cotter)

We shall also study about a cotter joint for joining two square rods viz.

(c) Gib and cotter joint (using one gib and one cotter)

4.3.1 SLEEVE AND COTTER JOINT:

Sleeve and cotter joint is used to connect two round rods. The rods are forged and increased in diameter to some length just to compensate for the loss of material for making rectangular hole to accommodate the rectangular tapered cotter in each rod. The ends of both the rods are chamfered to avoid burring and easy insertion in the hollow steel sleeve (socket/cylinder/muff). Both the rods are of the same dimensions. A hollow sleeve is passed over both the rods and has two rectangular holes for the insertion of cotter at right angle to the axes of the rods. The cotters are automatically adjusted due to the extra margin given for the clearance in the rod and the sleeve. The relative position of slots is such that the driving in of the cotters tends to force the rods towards each other in the socket or hollow sleeve. When sleeve and rods are subjected to axial tensile force the cotter is subjected to shearing force. These joints are useful for light transmission of axial loads.



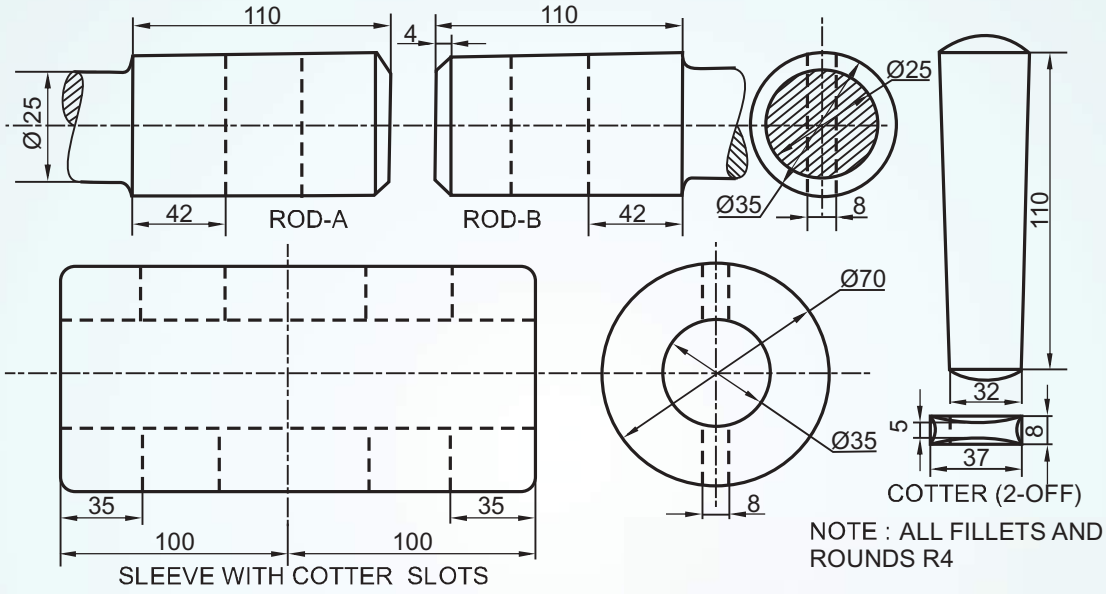
Example:

Figure given below (Fig : 4.3) shows the parts of a Sleeve and Cotter Joint. Assemble these parts correctly and then draw the following views to scale 1 : 1.

(a) Front view, upper half in section.

(b) Side view, viewing from the left.

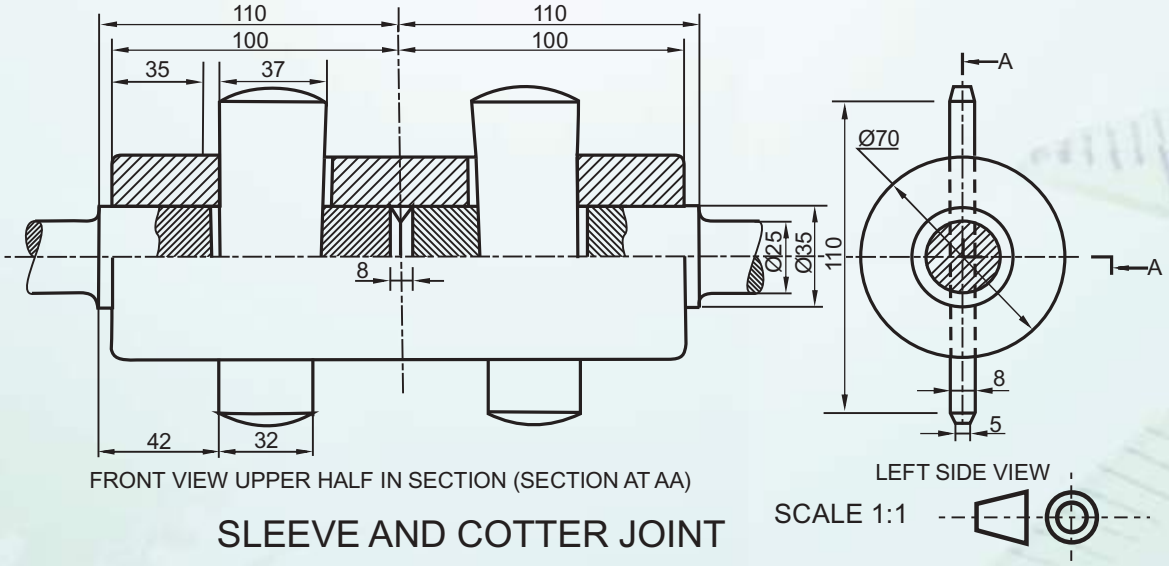
Print title and scale used. Draw the projection symbol. Give '8' important dimensions.



SLEEVE AND COTTER JOINT

Fig 4.3

Solution:



SLEEVE AND COTTER JOINT

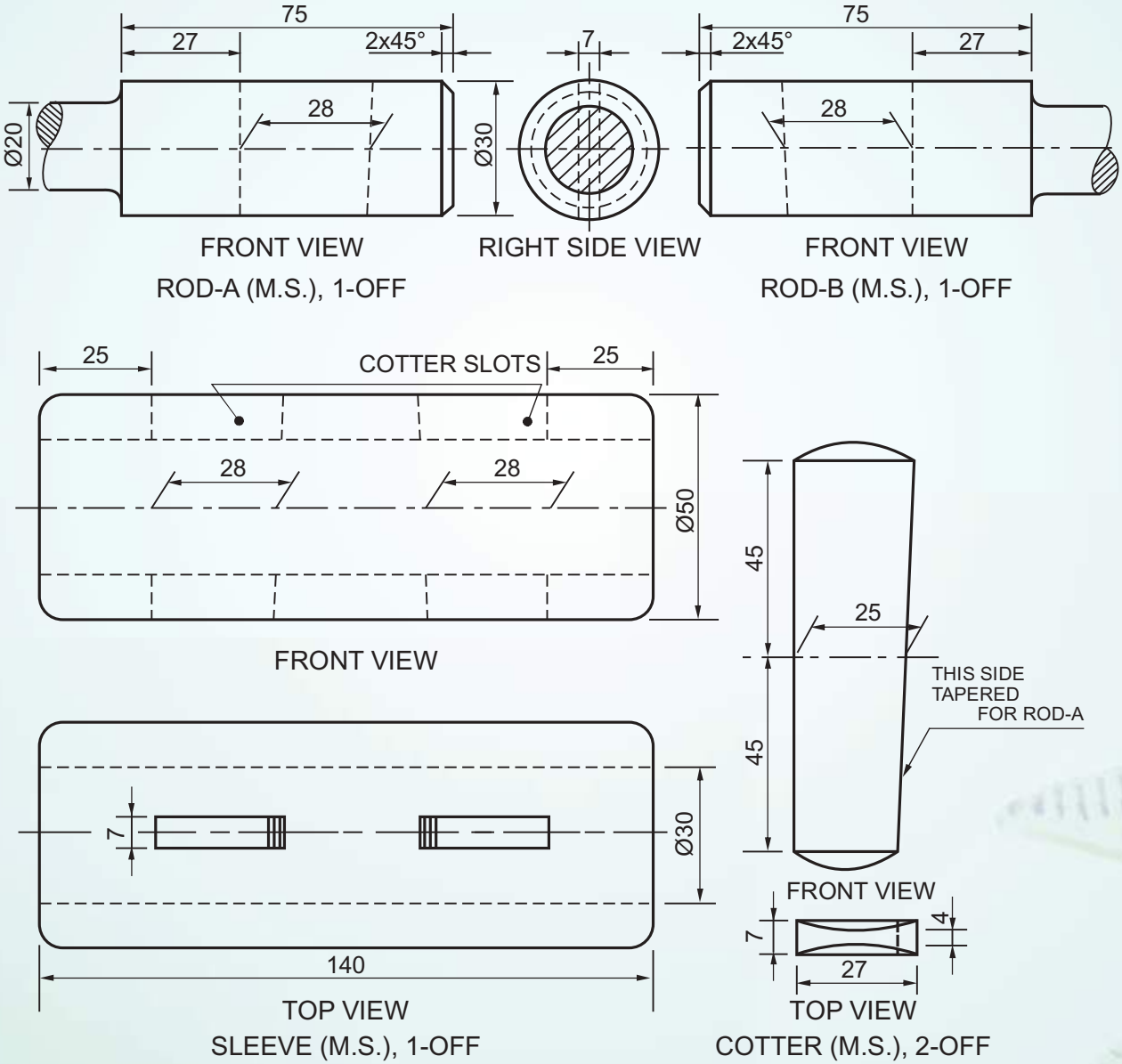
Fig: 4.4

Exercise:

The given figure shows the details of parts of a sleeve and cotter joint. Assemble these parts correctly and then draw the following views to scale 1:1.

(a) Front view lower half in section

(b) Left side view



SLEEVE AND COTTER JOINT

TAKE ALL ROUNDS AND FILLETS R4

Fig 4.5

Example:

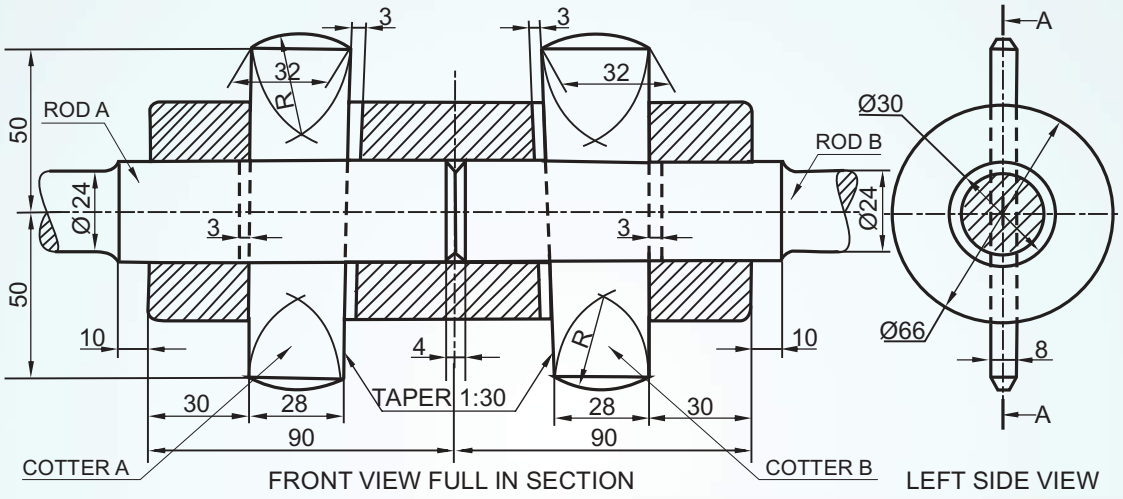
The figure given below shows the assembly of a Sleeve and Cotter Joint. Disassemble the following parts and draw the following views to a full size scale.

(a) Sectional front view of the Sleeve and Side view viewing from left.

(b) Front view of Rod A and Side view viewing from left.

(c) Front view of Cotter B in vertical position and Top view.

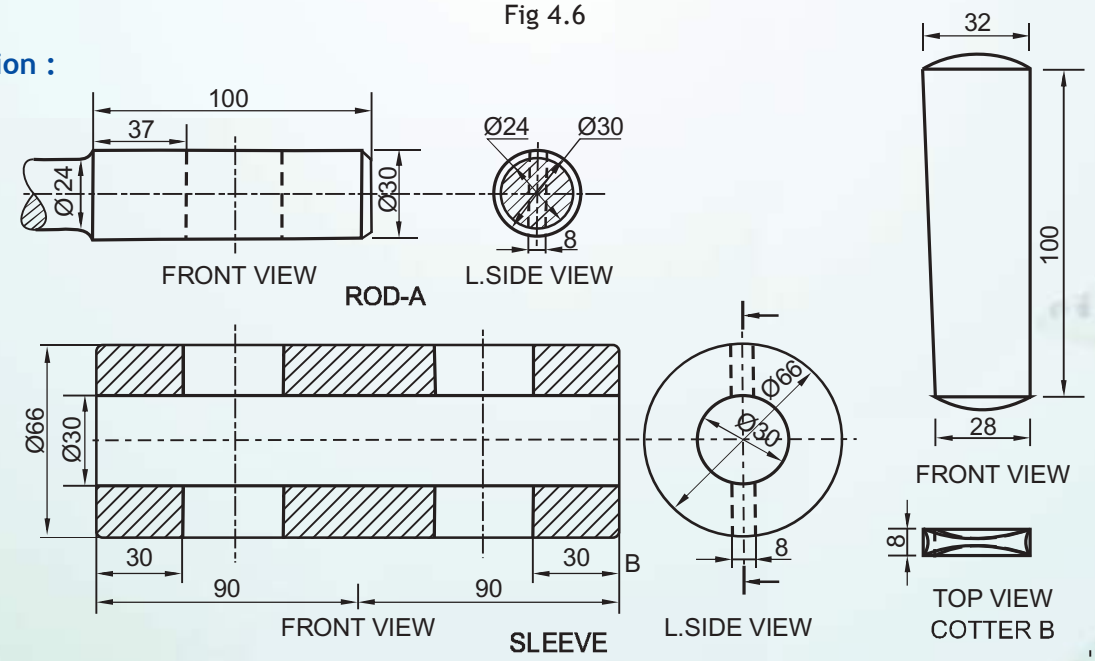
Print titles and scale used. Draw the projection symbol. Give 8 important dimensions.



SLEEVE AND COTTER JOINT

Fig 4.6

Solution :



SLEEVE AND COTTER JOINT SCALE 1:1

Fig 4.7

Exercise:

The figure given below shows the assembly of a Sleeve and Cotter joint. Disassemble the parts and draw the following views of the following parts, to scale 1:1. Keep the position of the parts same with respect to V.P. and H.P.

(a) SLEEVE

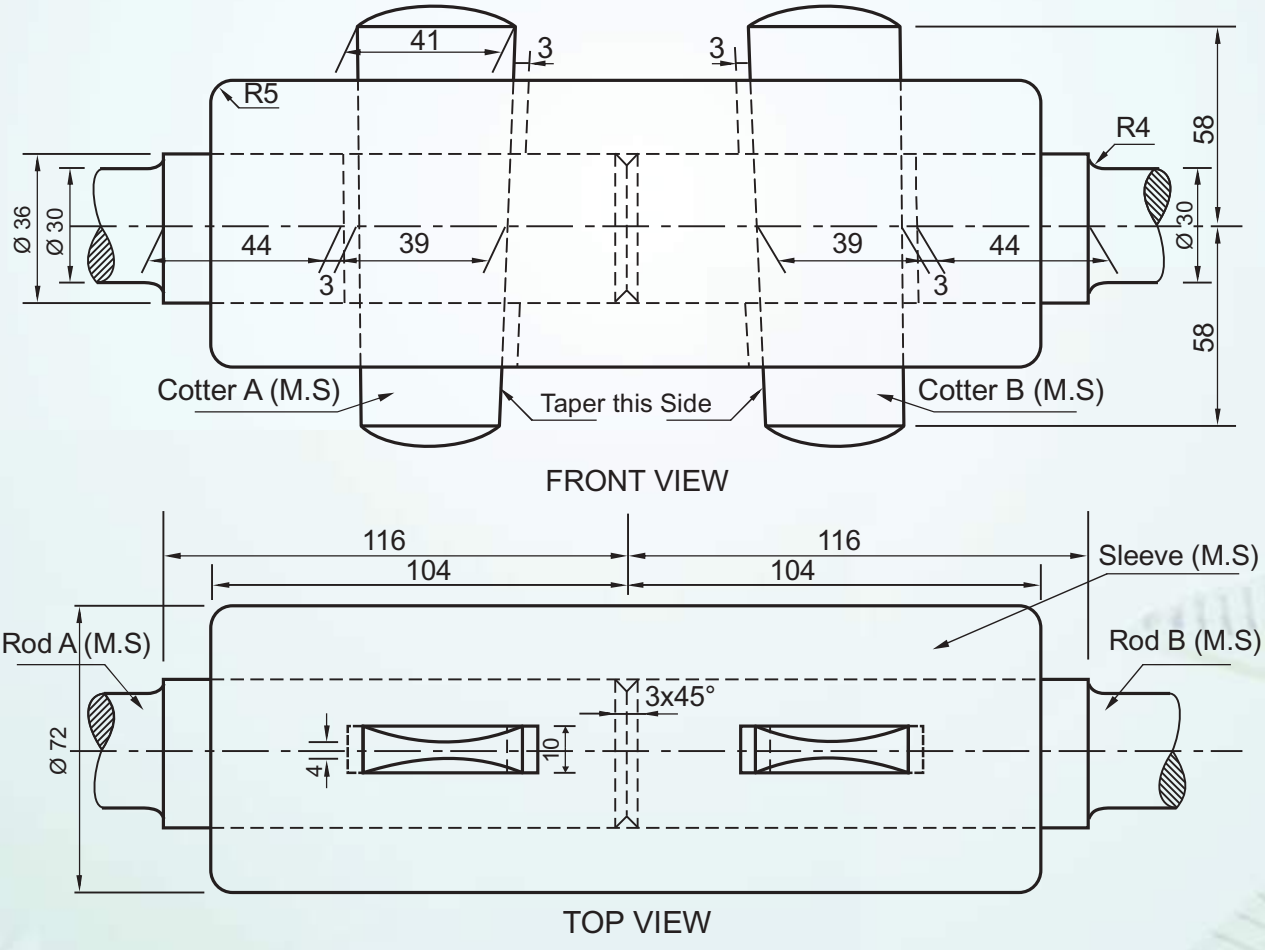
(i) Front view, upper half in section

(ii) Side view, looking from left

(b) COTTER B

(i) Front view

(ii) Side view



SLEEVE AND COTTER JOINT

Fig 4.8

Exercise:

The figure given below shows the assembly of a Sleeve and Cotter joint. Disassemble the parts and draw the following views of the following parts, to scale 1:1. Keep the position of the parts same with respect to V.P. and H.P.

(a) SLEEVE

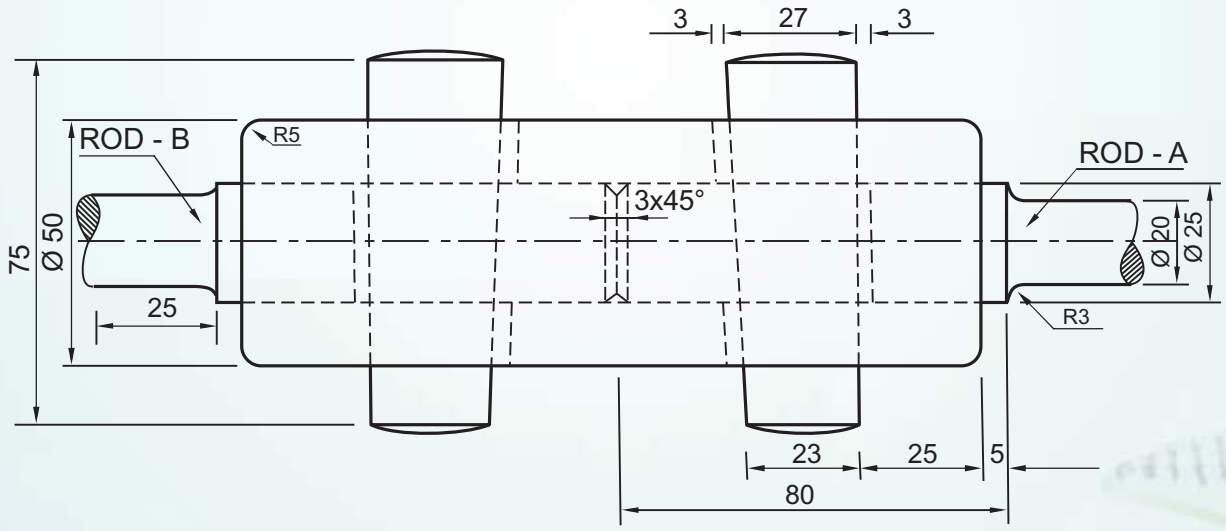
(i) Front view, lower half in section

(ii) Side view, looking from right

(b) ROD A

(i) Front view

(ii) Side view looking from right

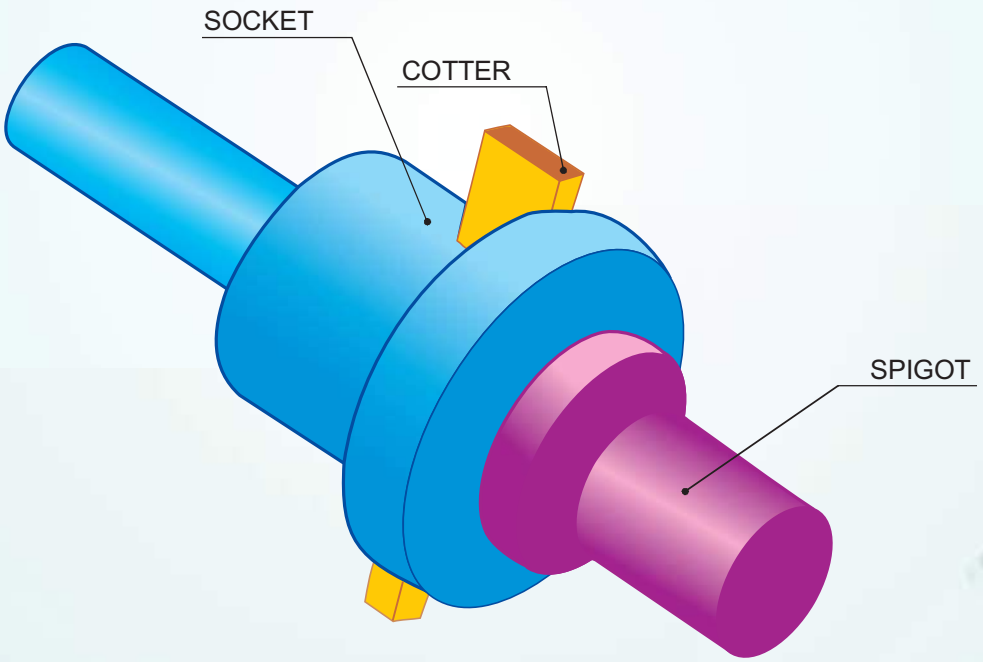


SLEEVE AND COTTER JOINT

Fig. 4.9

4.3.2 SOCKET AND SPIGOT JOINT

Socket and Spigot Cotter Joint connects two rods in such a way that it can transfer axial compression or tensile load. In this case one end of the first rod is enlarged in diameter to some length, just to compensate the loss of material due to rectangular hole made in it to accommodate a cotter. A collar is provided at the end of the enlarged end. This is known as spigot. One end of the second rod is formed into a socket or box having an appropriate inner diameter to fit the spigot along with a collar. For simplicity socket can be considered as a hollow pipe having one side solid and the other hollow, while the spigot is a solid rod. The solid spigot is nearly of the size of the internal radii of the socket, where it can fit. They have a rectangular cavity of tapering construction through both the parts, i.e., spigot and socket where the cotter is inserted. This cavity or slot is kept slightly out of alignment so that driving in of the cotter tends to pull the slots in a line, thus making the joint perfectly tight and rigid. A clearance of 2 to 3 mm is made in these joints for the proper functioning of the cotter.



SOCKET AND SPIGOT JOINT

Fig 4.10

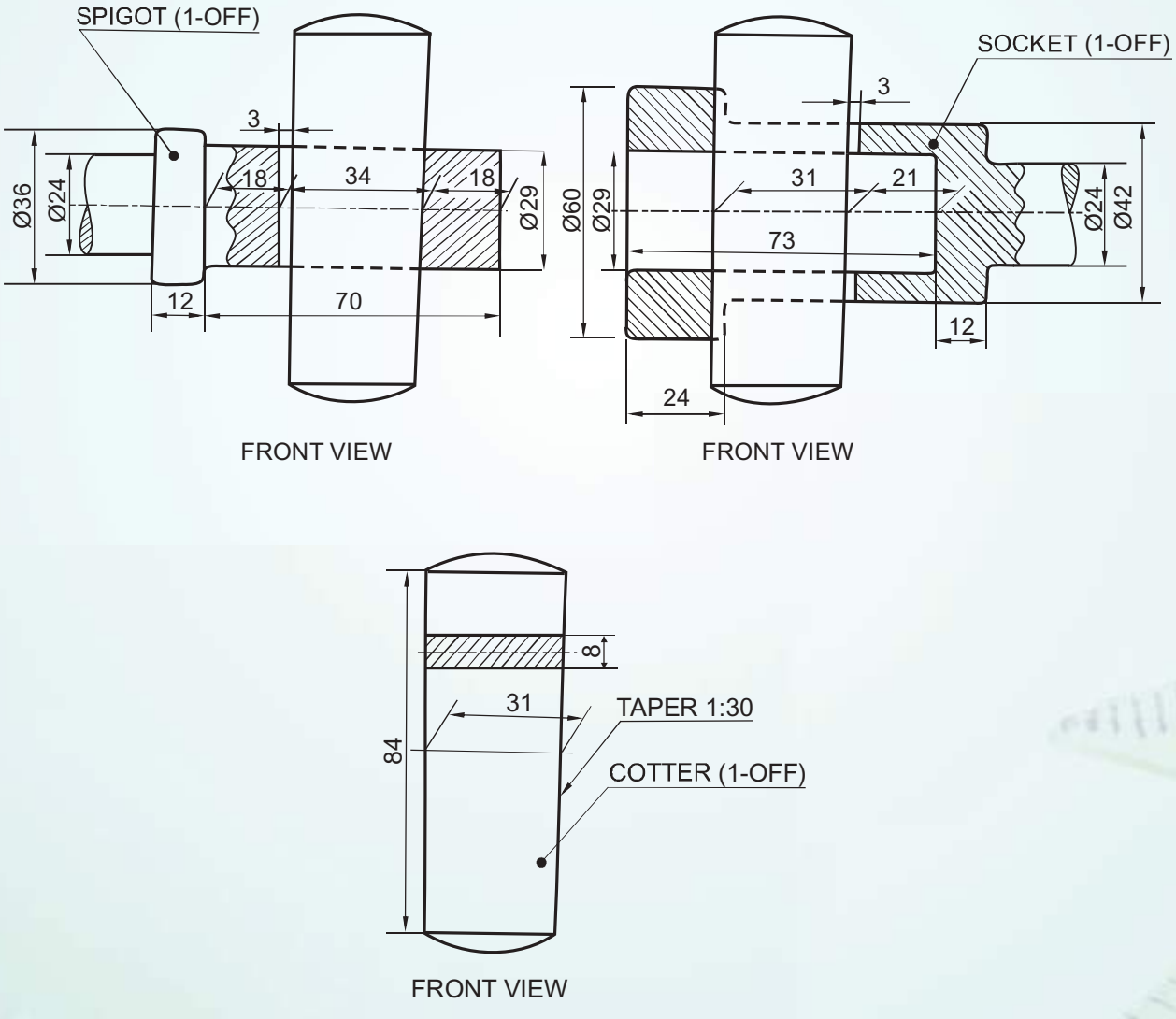
Example:

The details of a Socket and Spigot joint are shown below. Assemble these parts correctly and then draw its following views to scale full size.

(a) Front view upper half in section.

(b) Side view, as viewed from right.

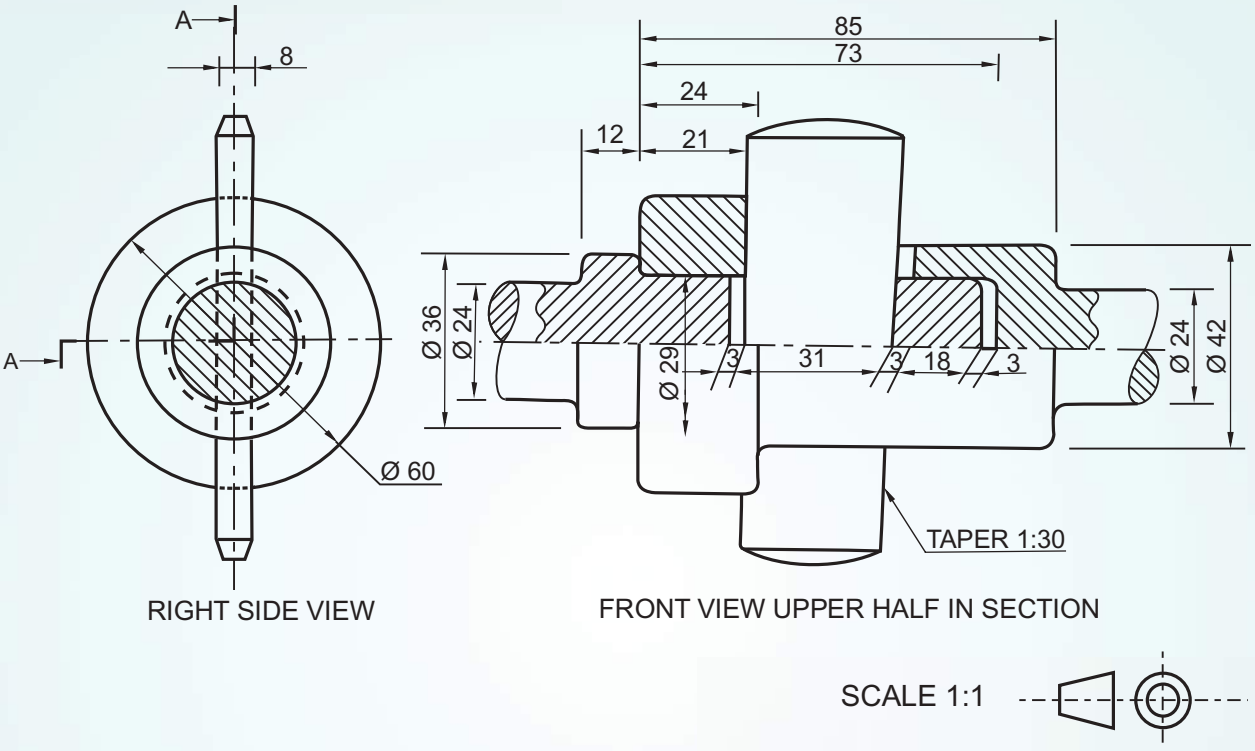
Print heading and scale used. Draw projection symbol. Give six important dimensions



DETAILS OF A SOCKET AND SPIGOT COTTER JOINT

Fig 4.11

Solution:



SOCKET AND SPIGOT JOINT

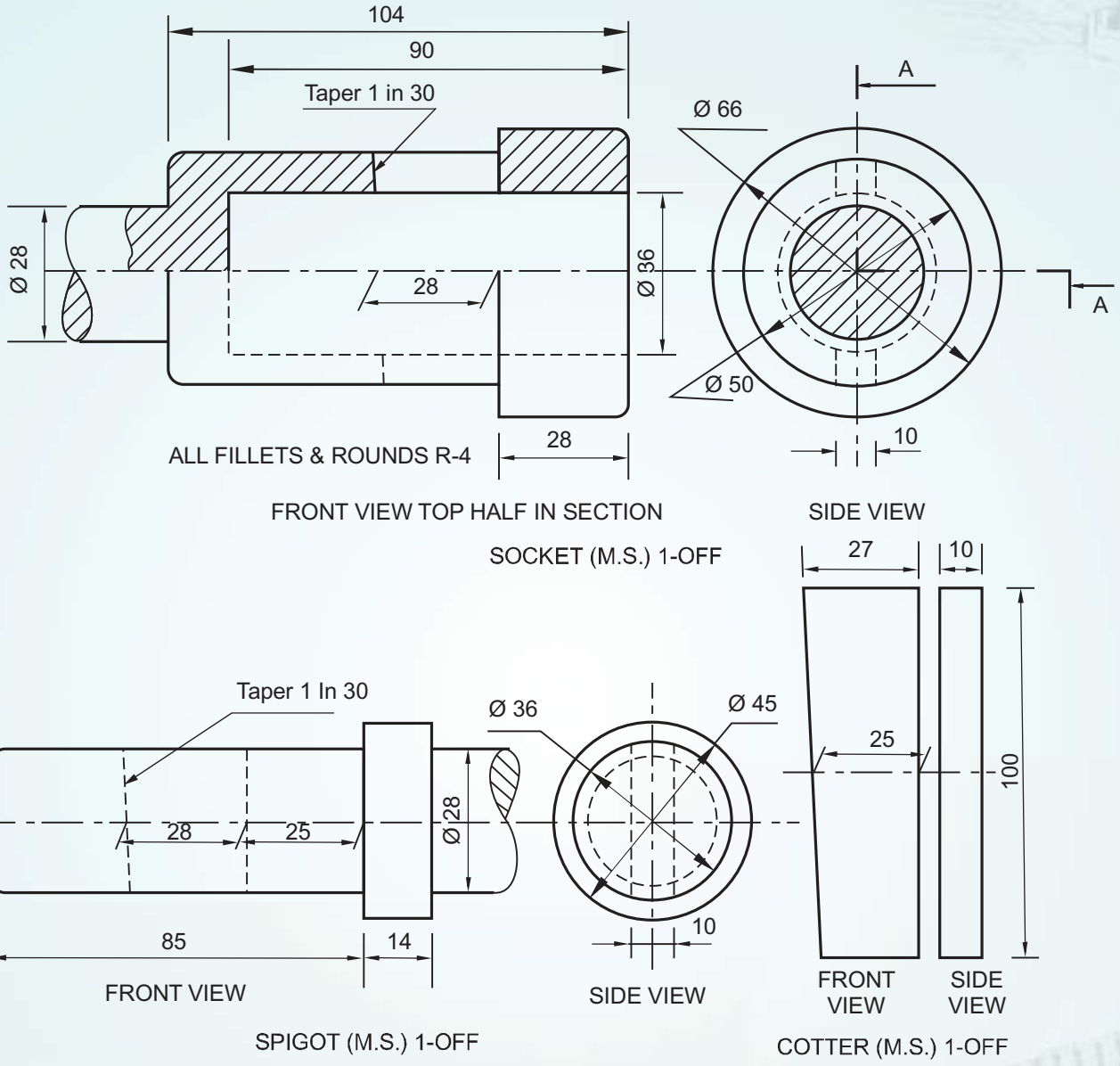
Fig 4.12

Exercise:

The given figure shows the details of parts of a SPIGOT AND SOCKET JOINT. Assemble these parts correctly, and then draw the following views to scale 1:1

(a) Front view, lower half in section

(b) Right side view



SPIGOT AND SOCKET JOINT

Fig. 4.13

Example:

The following figure shows the assembly of a Socket and Spigot Cotter Joint. Disassemble the following parts and draw the following views to a full size scale.

SOCKET

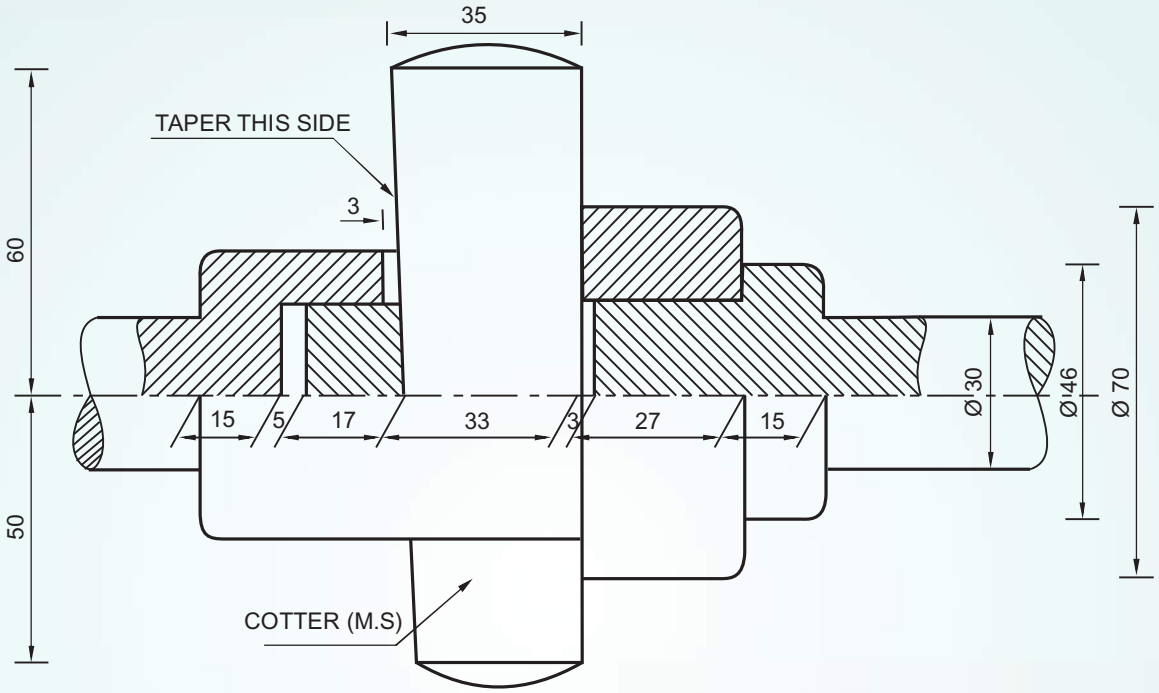
(a) Front view upper half in section

(b) Left side view

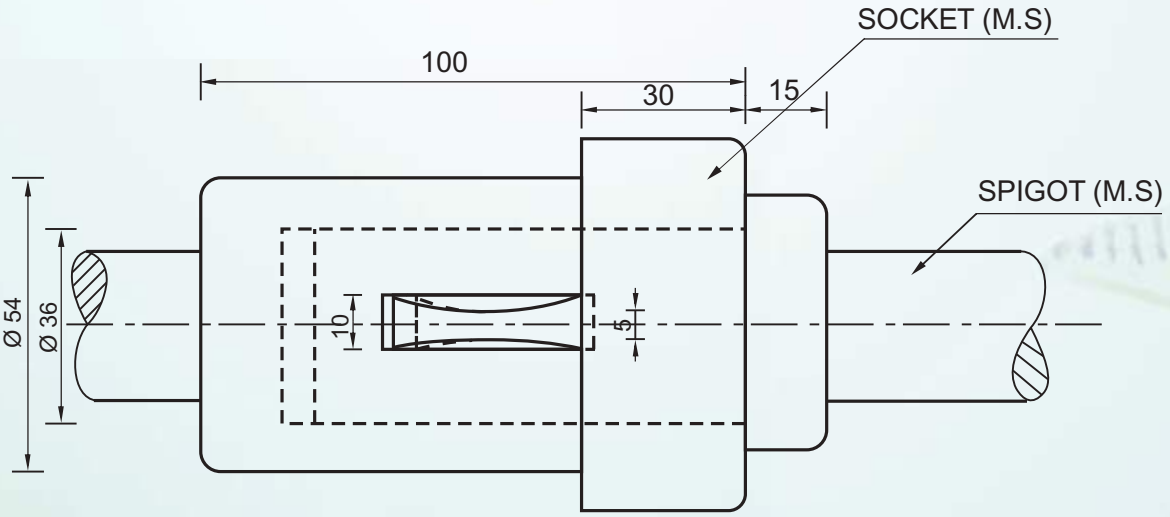
COTTER

(a) Front view

(b) Right side view



FRONT VIEW UPPER HALF IN SECTION



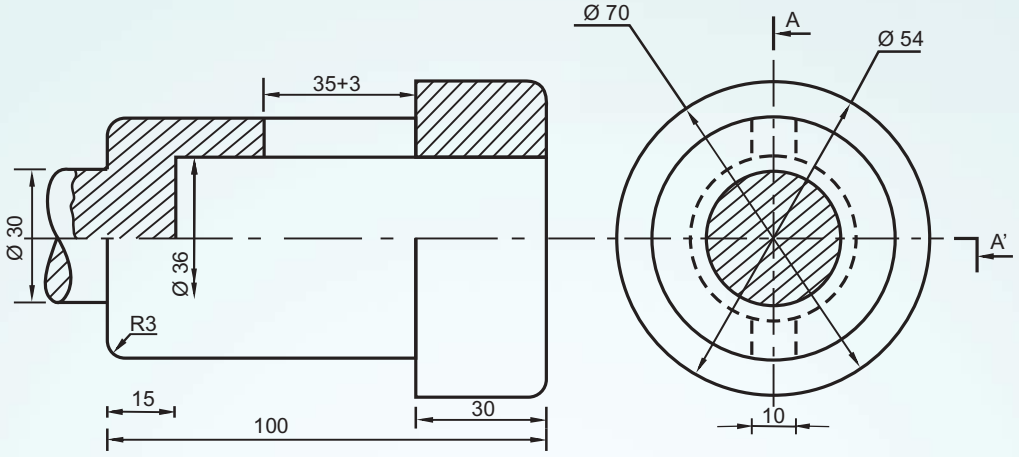
TOP VIEW

TAKE ALL ROUNDS R3

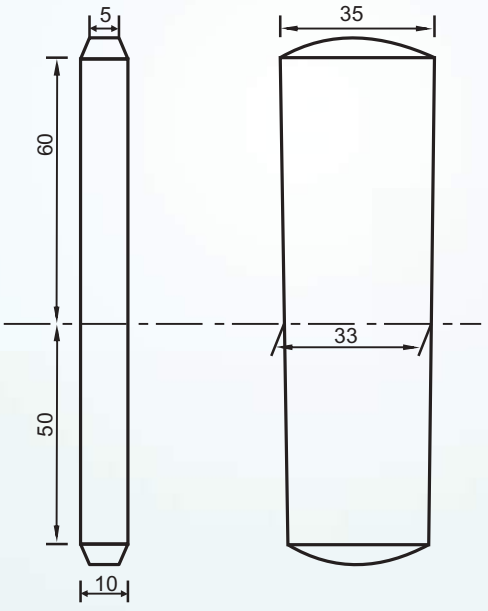
SOCKET AND SPIGOT COTTER JOINT

Fig. 4.14

Solution:

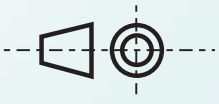


SOCKET



COTTER

SCALE 1:1



DIS ASSEMBLY OF SOCKET AND SPIGOT COTTER JOINT

Fig. 4.15

Exercise:

The figure given below shows the assembly of Socket and Spigot joint. Dis assemble the parts and draw the views of the following parts to scale 1:1. Keep the same position of the parts with respect to H.P. and V.P.

(a) **SOCKET**

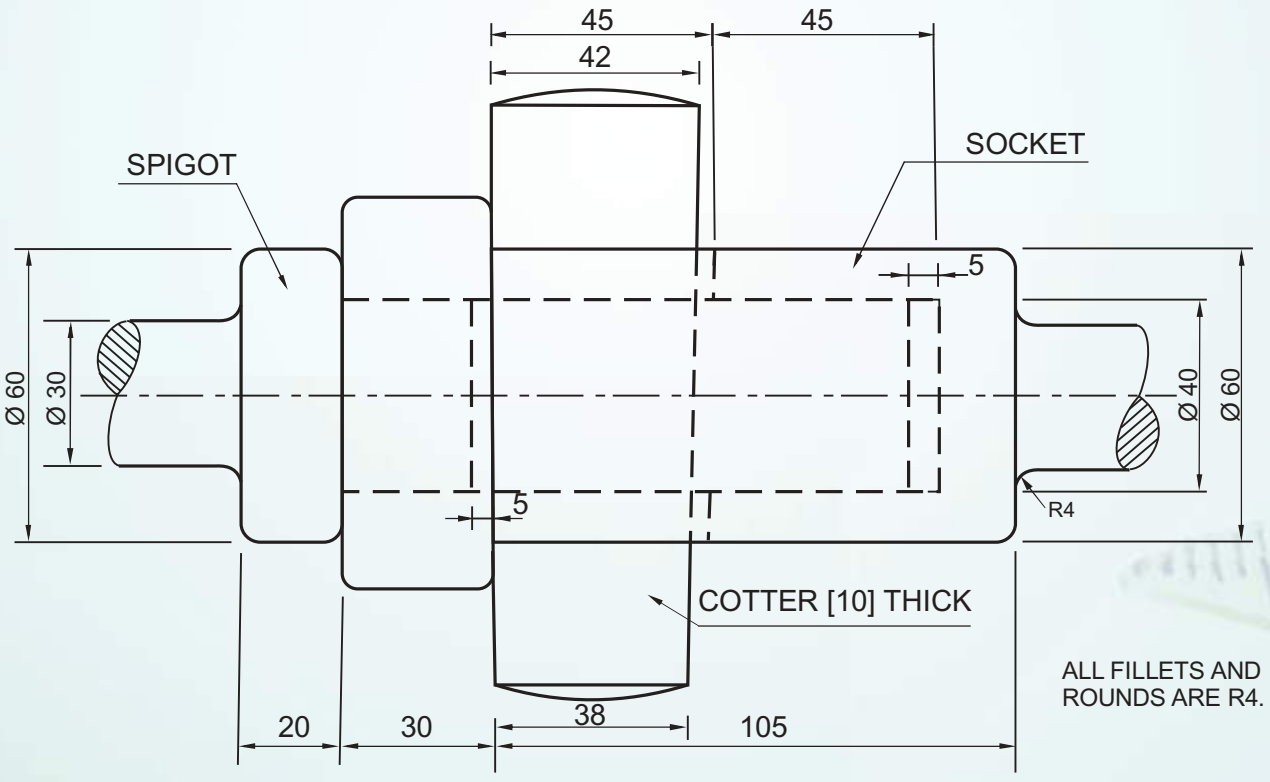
(i) Front view, lower half in section

(ii) Side view, looking from left.

(b) **SPIGOT**

(i) Front view, upper half in section

(b) Side view, looking from right.



SOCKET AND SPIGOT JOINT

Fig. 4.16

Exercise:

The following views of a Socket and Spigot Joint are given. Disassemble the parts as given below and draw the following views :

(a) SPIGOT

(i) Front view lower half in section.

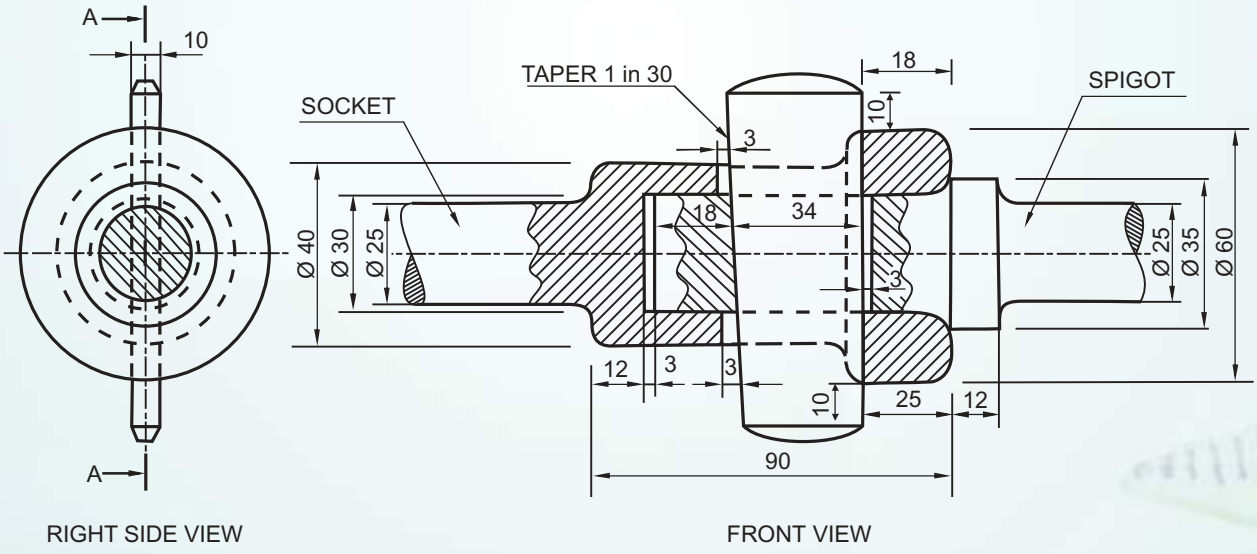
(ii) Side view from left.

(b) SOCKET

(i) Front view upper half in section

(ii) Right side view.

Print headings and scale used. Draw projection symbol. Give 8 important dimensions



SOCKET AND SPIGOT JOINT

Fig 4.17

4.3.3 GIB AND COTTER JOINT

This joint is used to join two rods of square or rectangular in cross section. The end of one rod is forged in the form of a fork or strap. The height of the other rod is increased for compensating the loss of material in making the slot for cotter. The Gib is made up of mild steel and has the same thickness as that of the cotter. The Gib has projections at the top and bottom ends which act like hooks. While connecting two rods the Gib is inserted first and pushed towards the end of the fork and then the cotter is hammered over. The tapering sides of the Gib and the cotter mate with each other, while their outer sides are parallel to each other and perpendicular to the common axis of the rods. Hence, when a Gib is used with a cotter, the opposite faces of the slots in the rods are parallel to each other. The Gib increases the tearing area of the cotter and prevents slackening of the joint besides holding the jaws of the strap or fork from opening wide when the cotter is inserted. The use of Gib and Cotter enables the parallel holes to be used. Here Gib and Cotter both have taper on one edge. This joint is useful to fasten connecting rods of a steam engine or marine engine.

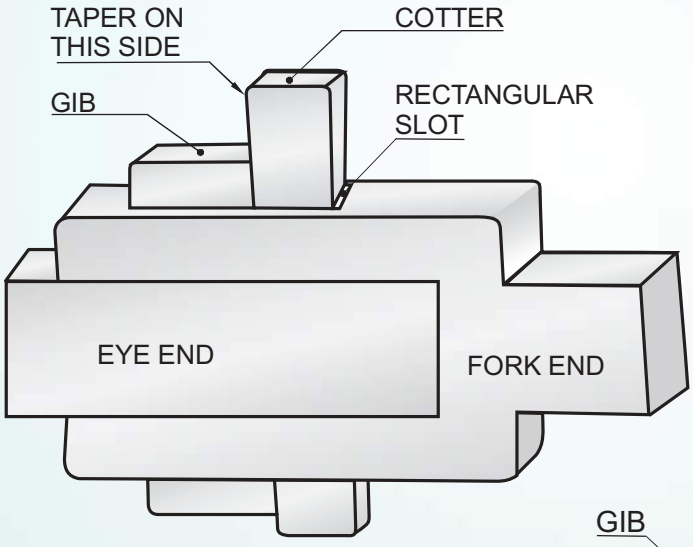


Fig. 4.18 (a)

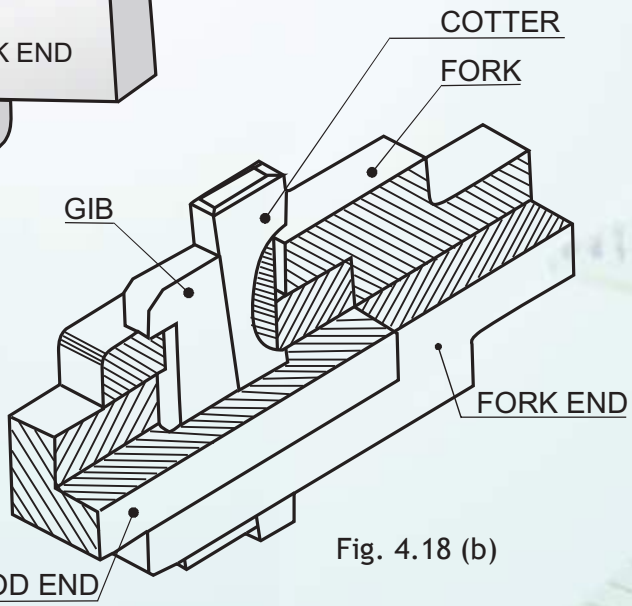


Fig. 4.18 (b)

SECTIONAL VIEW OF GIB AND COTTER JOINT

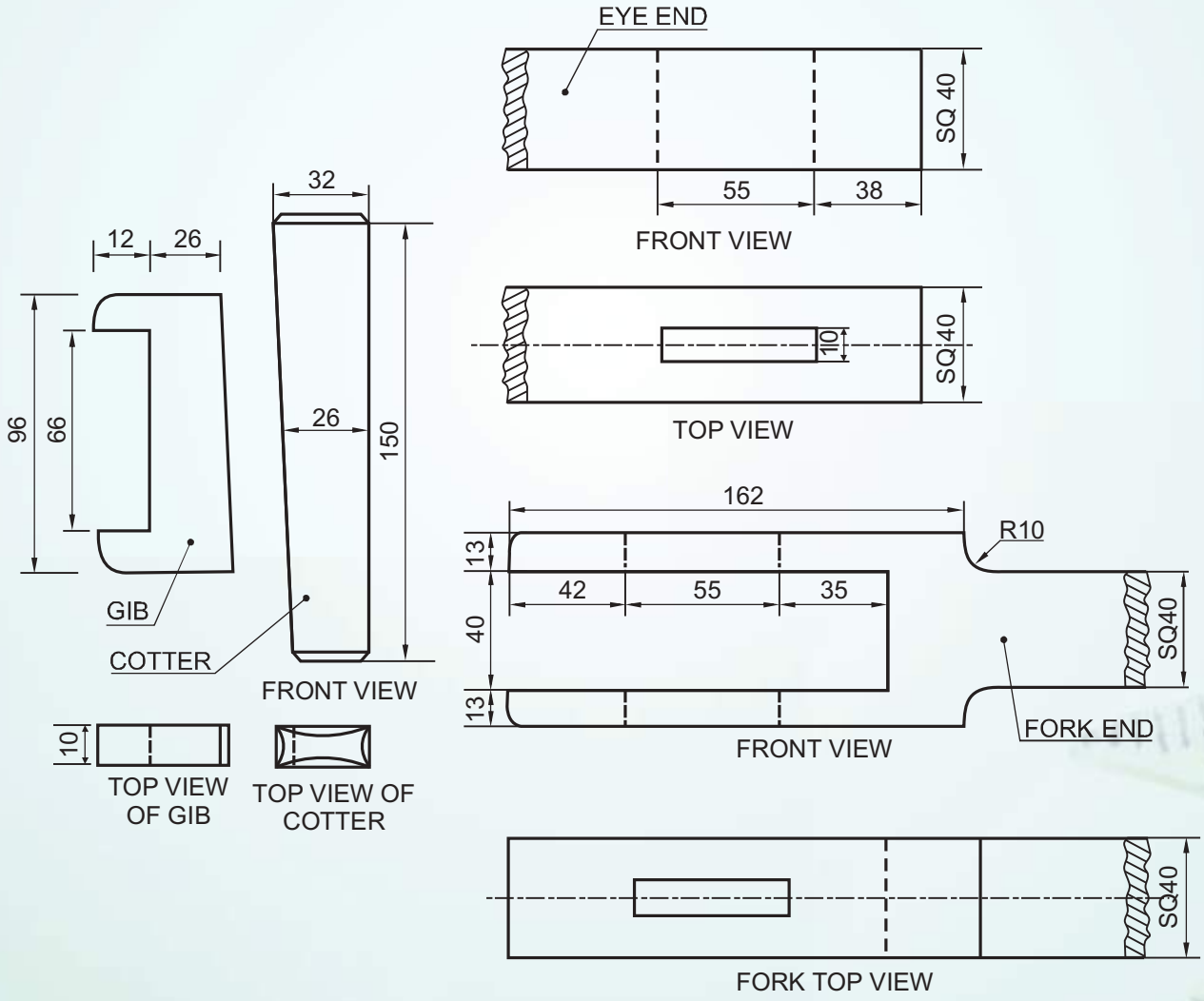
Example:

The figure given below shows the detail drawings of different parts of a Gib and Cotter Joint for joining two square rods. Assemble all the parts correctly and draw the following views to scale 1:1

(a) Front view, upper half in section.

(b) Side view, viewing from the left hand side.

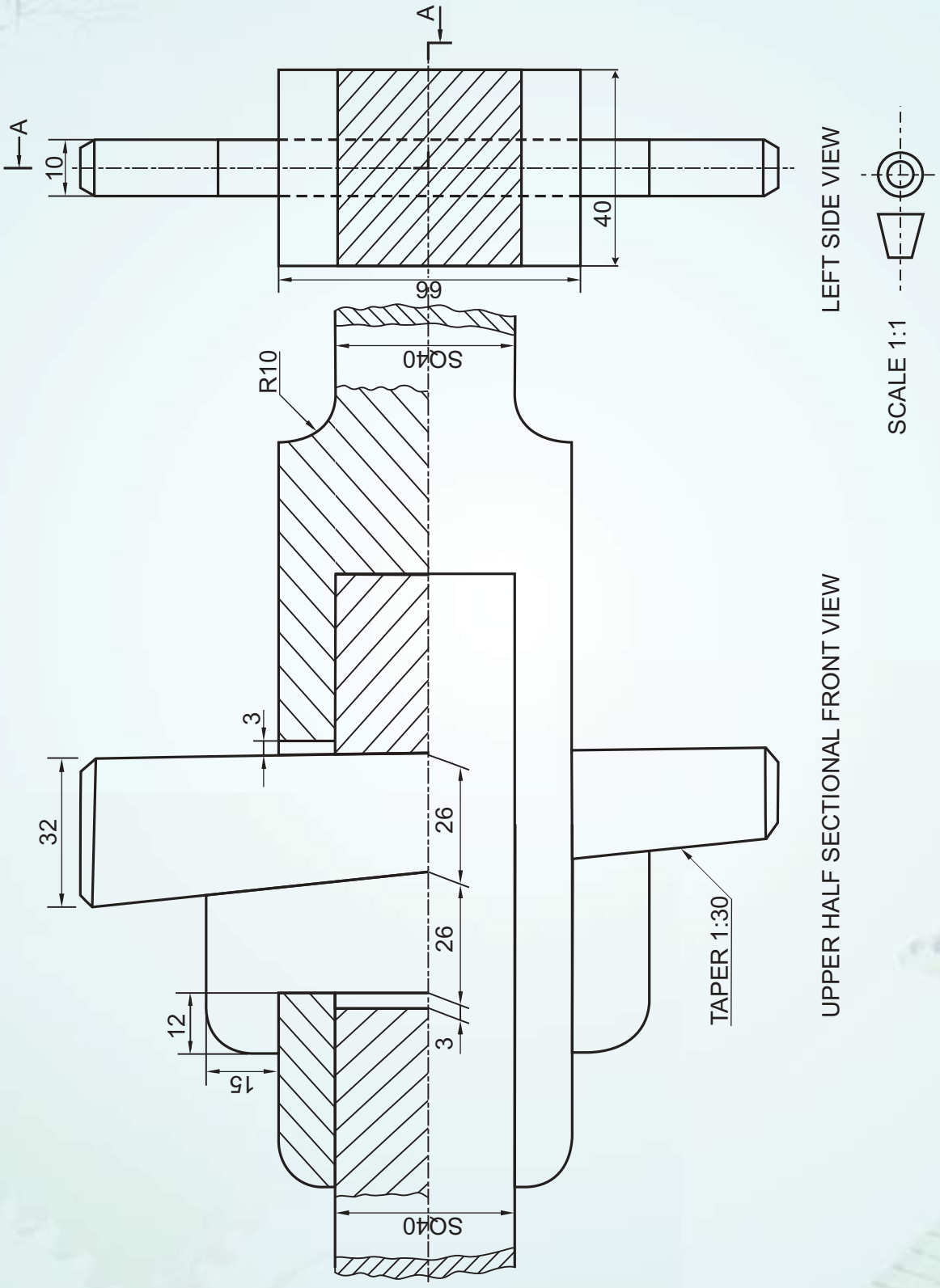
(c) Print title, scale used and draw the projection symbol. Give '6' important dimensions.



DETAILS OF A GIB AND COTTER JOINT

Fig 4.19

Solution:



ASSEMBLY OF A GIB AND COTTER

Fig. 4.20

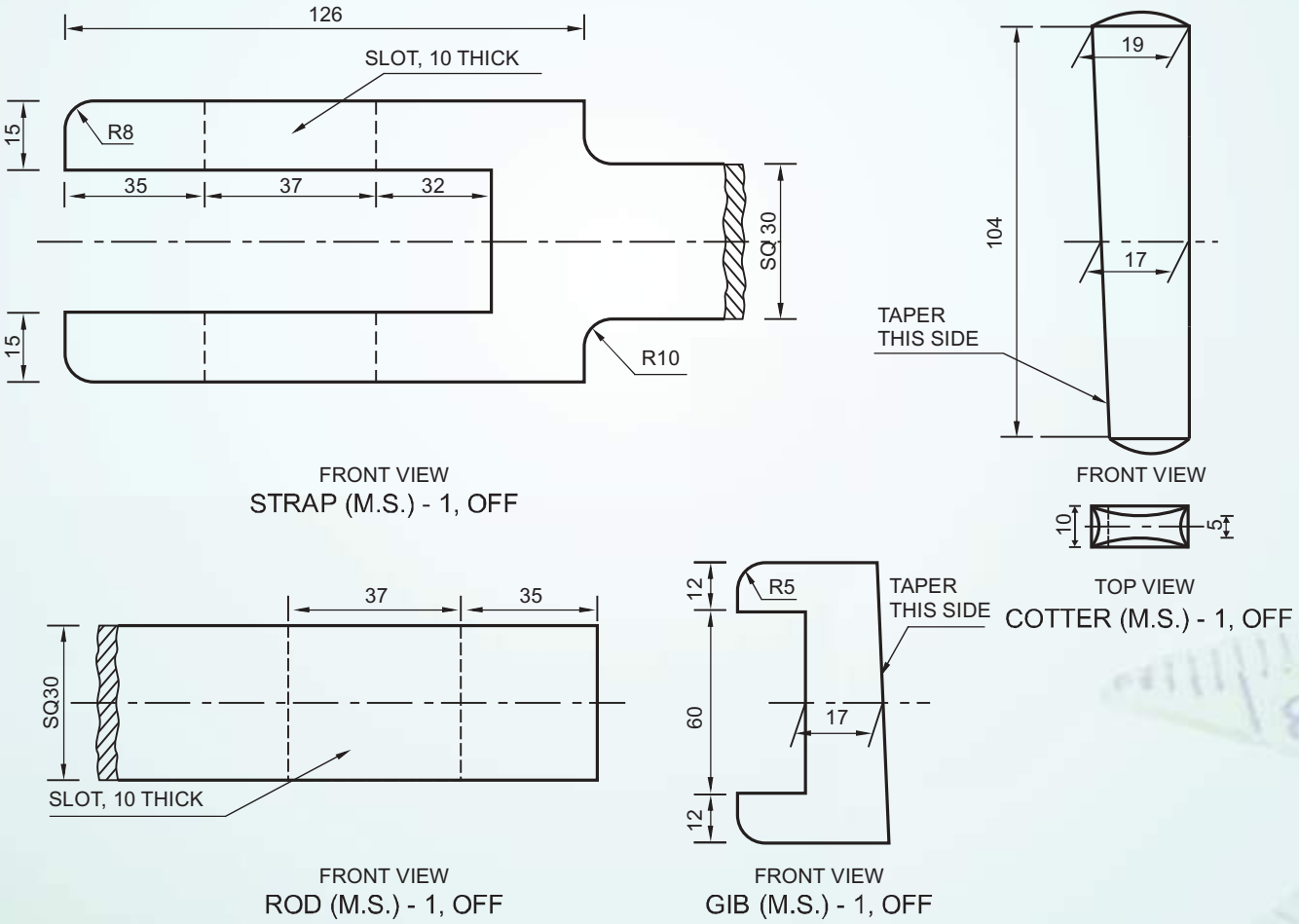
Exercise:

The figure given below shows the detail drawings of different parts of a Gib and Cotter Joint for joining two square rods. Assemble all the parts correctly and draw the following views to scale 1:1

(a) Front view, lower half in section.

(b) Side view, viewing from the left hand side.

(c) Print title, scale used and draw the projection symbol. Give '6' important dimensions.



DETAILS OF A GIB AND COTTER JOINT

Fig 4.21

Example:

The figure given below shows the assembly of a Gib and Cotter joint. Disassemble the following parts and draw the following views to a full size scale.

(i) STRAP (FORK)

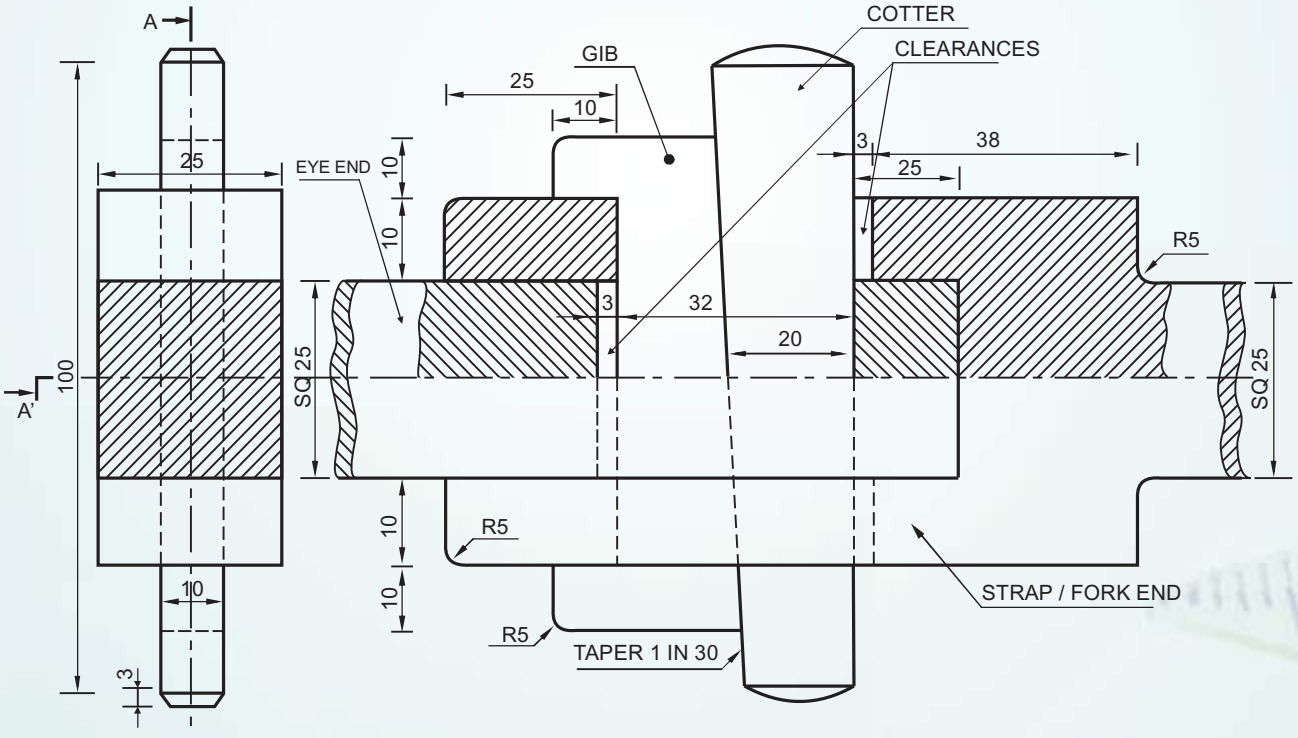
(a) Front view lower half in section

(b) Top view

(ii) GIB

(a) Front view

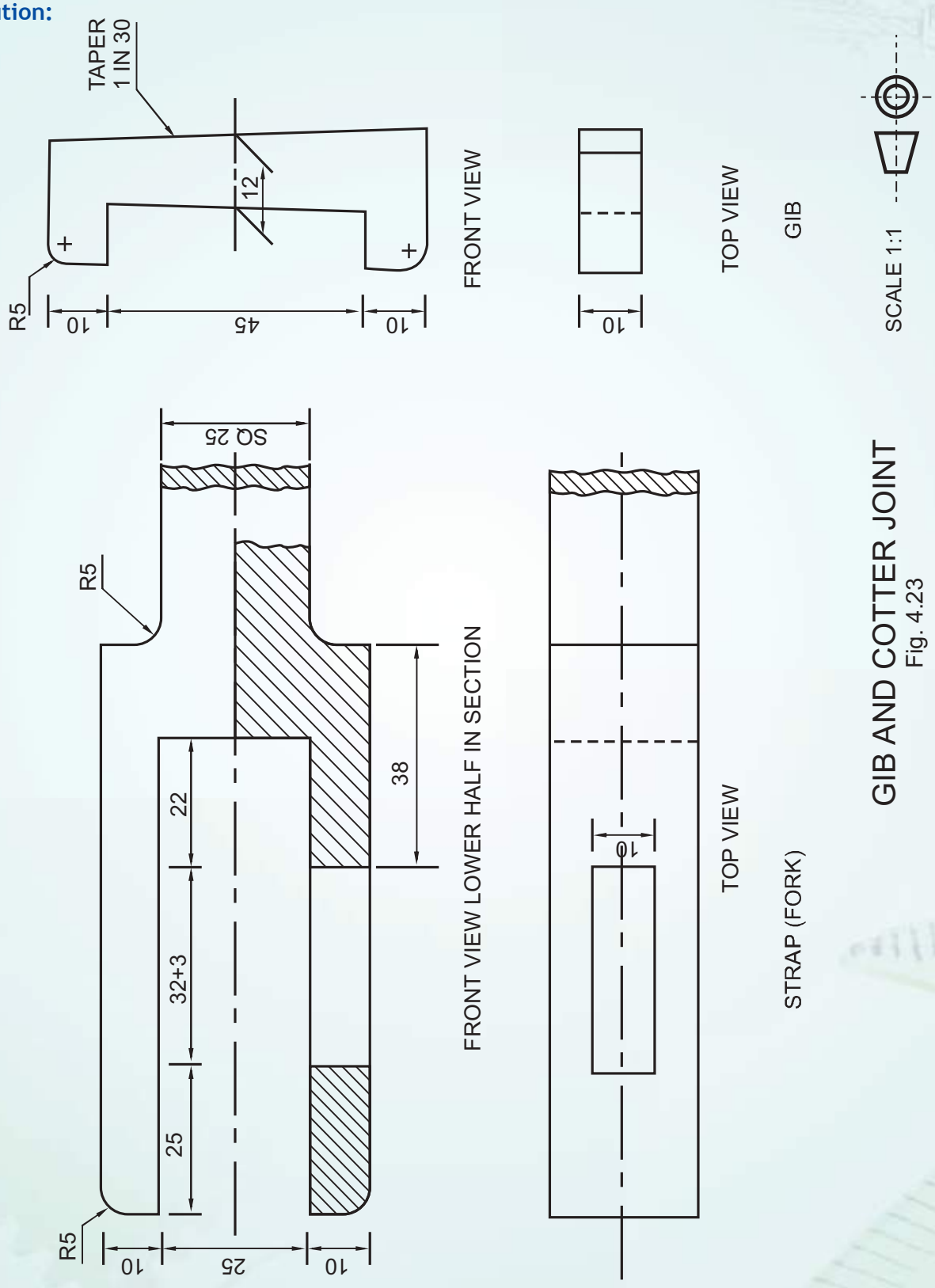
(b) Top view



GIB AND COTTER JOINT

Fig. 4.22

Solution:



GIB AND COTTER JOINT
Fig. 4.23

Exercise:

The figure shows the front view of the assembly of a Gib and Cotter Joint for square rods. Dis assemble the parts and then draw the following views of the following parts to scale 1:1, keeping the parts in the same position, with respect to H.P. and V.P.

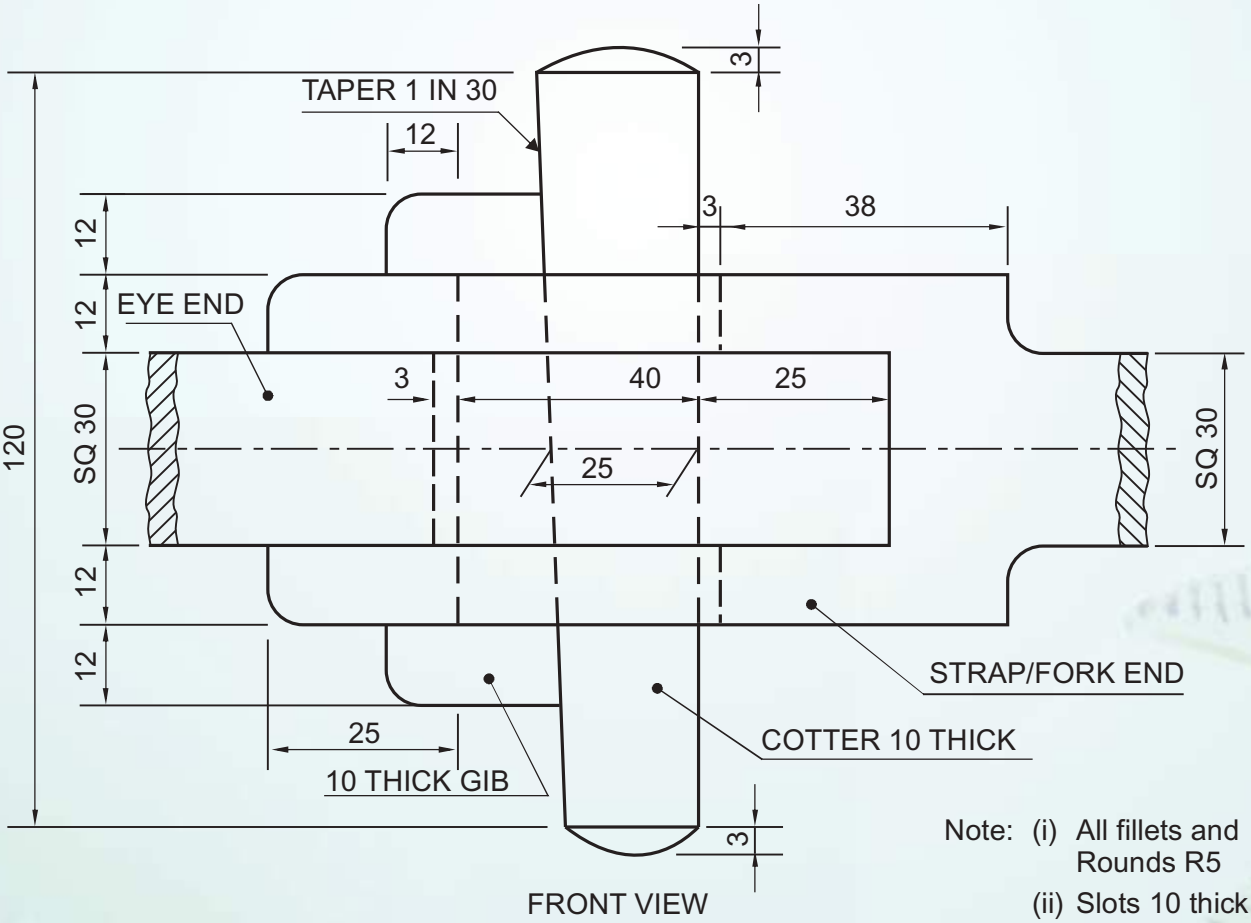
(1) STRAP (FORK)

- (i) Upper half sectional front view
- (ii) Top view

(2) GIB

- (i) Front view
- (ii) Top view

Print title, scale used and draw the projection symbol. Give '6' important dimensions.



Note: (i) All fillets and Rounds R5
(ii) Slots 10 thick

GIB AND COTTER JOINT
Fig. 4.24

Exercise:

The orthographic views of a Gib and Cotter Joint assembly are given below. Disassemble the parts and draw the following views of the following parts to scale 1:1, keeping the parts in the same position with respect to H.P. and V.P.

(a) FORK END

(i) Front view lower half in section (ii) Top view

(b) EYE END

(i) Front view lower half in section (ii) Top view

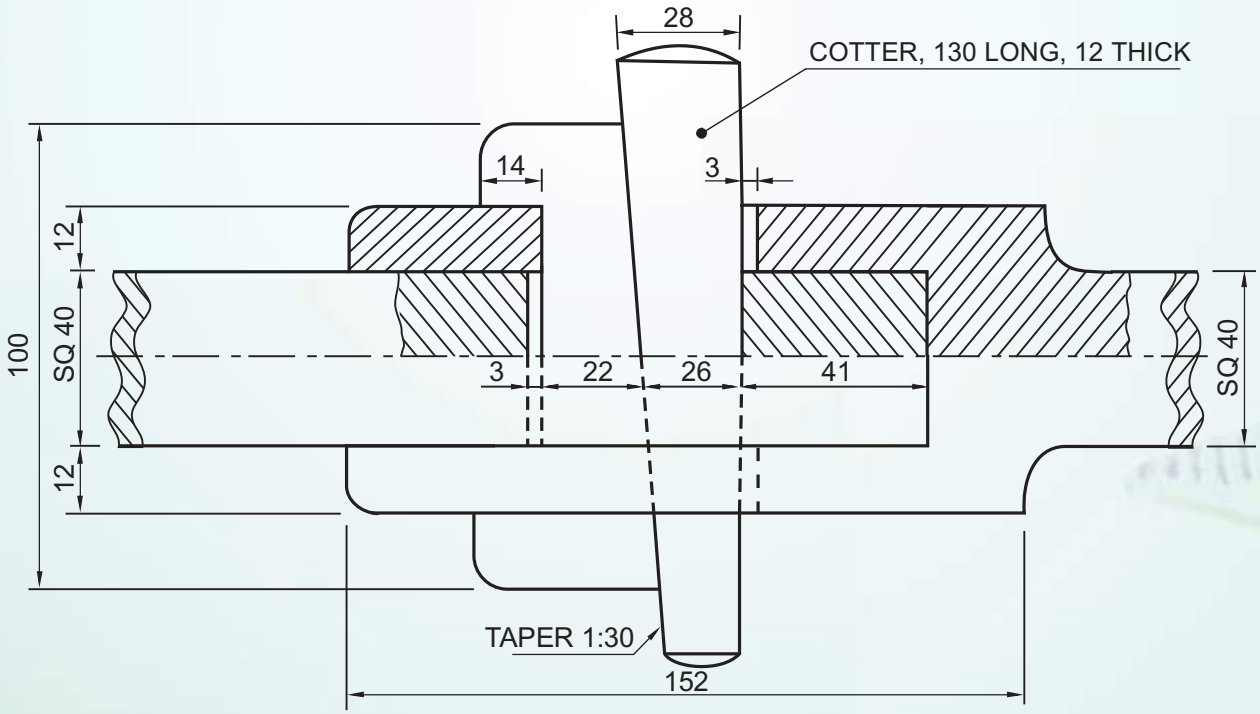
(c) GIB

(i) Front view (ii) Top view

(d) COTTER

(i) Front view (ii) Top view.

Print headings of the above views and scale used. Draw projection symbol. Give six important dimensions.



FRONT VIEW UPPER HALF IN SECTION

GIB AND COTTER JOINT

Fig 4.25