CHAPTER 7

PULLEYS

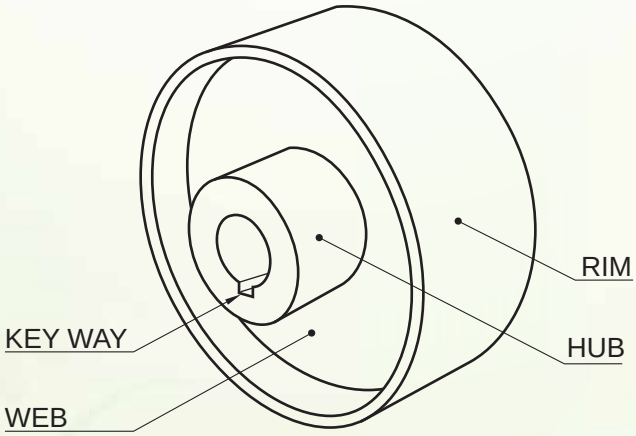
7.1 INTRODUCTION

In every machine or toy, we use power to operate and perform its function. This power is obtained mostly by the motor, run on electricity or battery. To transfer the power from the motor to the operational part of the machine, we use a combination of pulleys and belt (flexible connector). Pulleys are used in very small sizes to be fitted in wrist watches and tape recorders, as well as quite big in size as in ships.

The pulley used, with the motor shaft is called driver and with machine shaft is called driven. The size of driver and driven pulleys define the ratio of speed transferred as reduced or increased. If both the driver and driven pulley are of same diameter then the speed of the shaft / spindle will be same, if driver is of small diameter with respect to driven then the speed will be reduced at operating shaft and vice versa.

TYPES OF PULLEYS

Fig 7.1



PARTS OF A PULLEY

Fig 7.2

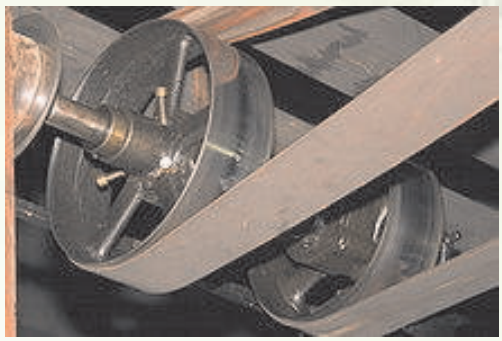
Outer cylindrical surface of the pulley used to hold the belt is called RIM, while the inner cylindrical part to be mounted on the shaft is called HUB. The RIM and the HUB are joined together with solid web or spokes or splines depending upon the size of the pulley. In the pulleys of diameter up to 200 mm a solid web is provided. The pulley is attached to the shaft either by the key or by a set screw of the suitable size and type.

The driver pulley and driven pulley are connected with different type of endless belts i.e. Flat Belt, Rope Belt, V-Belt etc. The material of the belt must be strong in tension yet flexible and relatively light in weight i.e. canvas, leather, rubber and so on.

Pulley - drive is very easy to install and require minimum maintenance. The power is transmitted from one shaft to another by means of friction between the belt and the rim. The losses in power transmission are negligible in V-belt pulley rather than flat-belt pulley. However power transmission capacity reaches its limit when the belt starts to slip.

Now we understand that pulleys allow us to

1. Lift loads up, down and sideways.
2. Rotate things at different speeds.



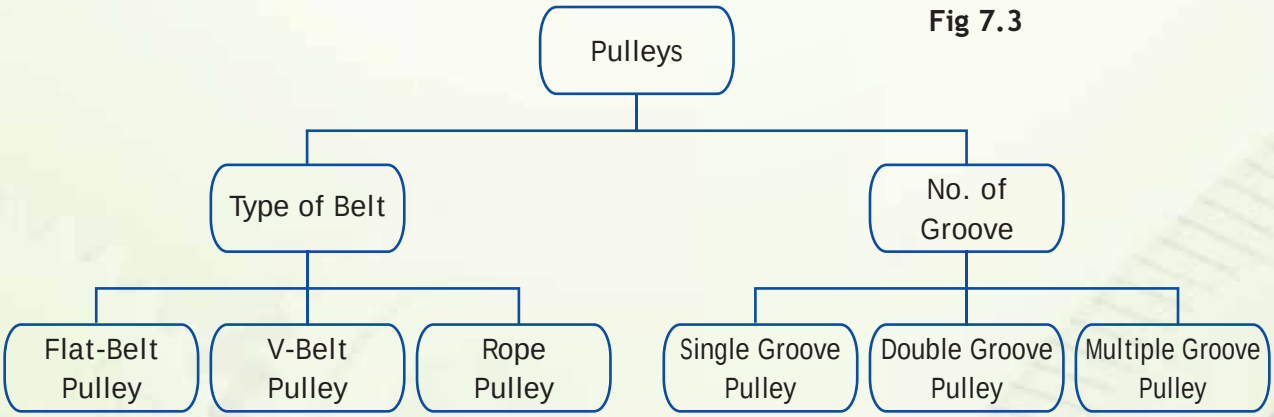
FLAT BELT DRIVE

V-BELT DRIVE

ROPE DRIVE

Fig 7.3

Pulleys are classified as follows :



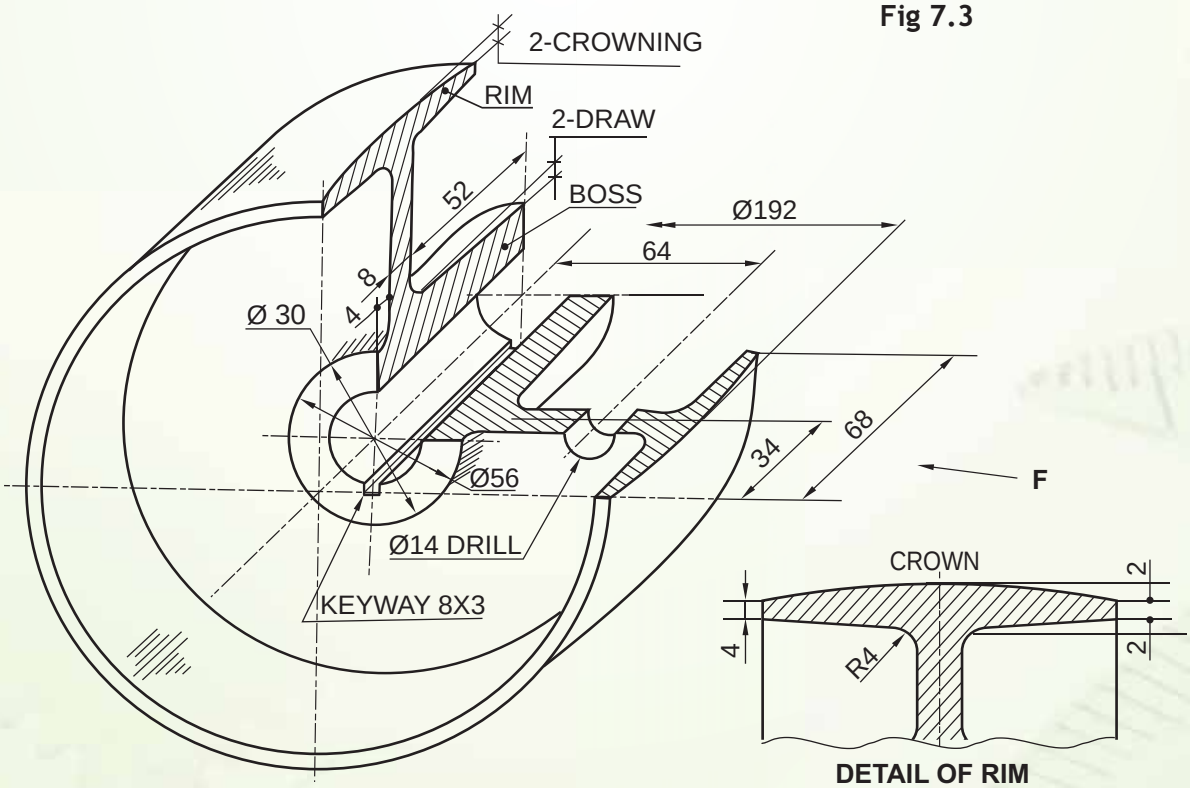
So pulley is a simple machine used in our day to day life to complete the work with less efforts. In this class we will study Flat Belt and V-Belt pulleys, upto 200 mm diameter in detail.

7.2 FLAT BELT (SOLID C.I.) PULLEY

The rim of the flat belt pulley is not flat it is slightly convex and this is known as the crowning. Actually the rotating belt around the pulley has a tendency to rise to the highest point of the rim. In case of a flat rim, there are chances of the slipping off of belt along the side of the pulley. But the crowning (convex curvature) tends to keep the belt in the middle of the rim.

The pulley is rigidly held to the shaft by key. The keyway is cut with half thickness in hub and half in shaft. The hub is having thickness to bear the rotational torque of pulley. The out side of the hub and the inside of the rim are slightly tapered to facilitate the removal of the pattern from the mould at the time of casting.

SOLID WEB
CAST IRON PULLEY
Fig 7.3



SOLID WEB (C.I.) PULLEY
Fig 7.4

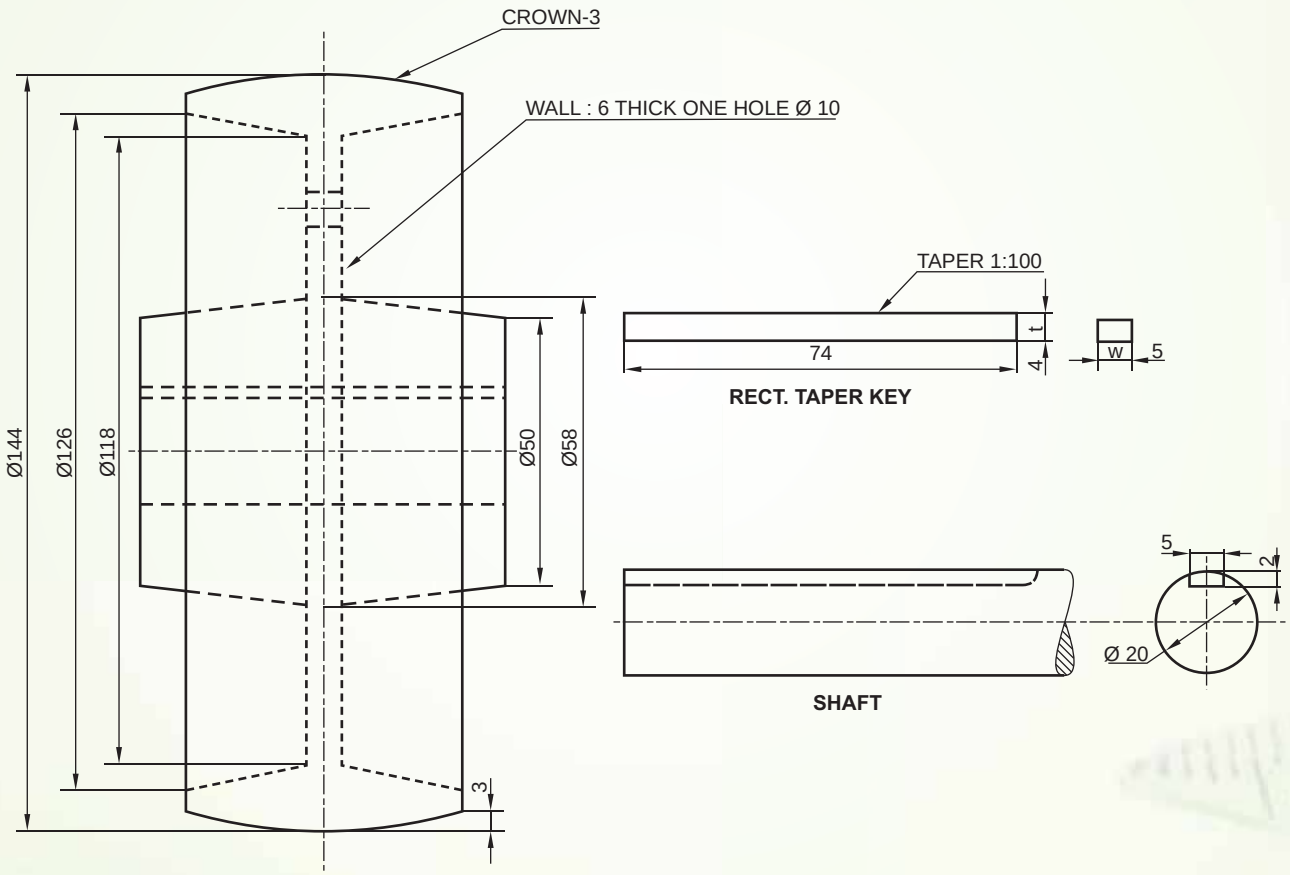
Example 1 :

Draw the following Orthographic Views of the properly assembled Solid C.I. pulley, shaft and Rectangular Taper Key. As shown in Fig 7.5

(a) Front View, upper half in section.

(b) Side View.

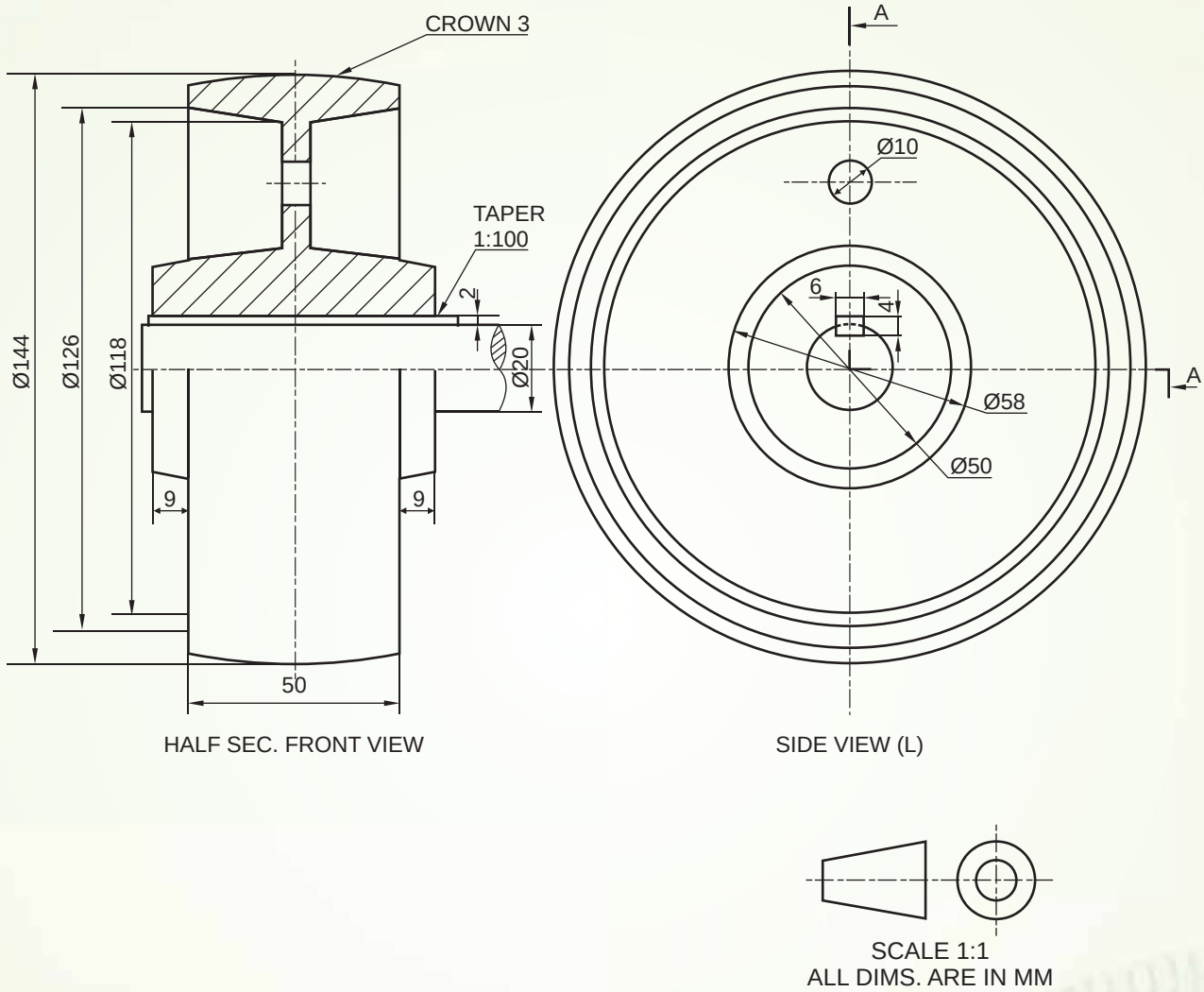
Write title and scale used. Draw projection symbol. Give '6' important dimensions.



DETAILS OF A SOLID CAST IRON PULLEY

Fig 7.5

Solution :



SOLID C.I. PULLEY

Fig 7.6

Exercise 1 :

The pictorial view of a Solid Web Cast Iron Pulley has been shown in Fig 7.4. Draw its following Views :

1. Front View with upper half in section.
2. Side View looking from left side.

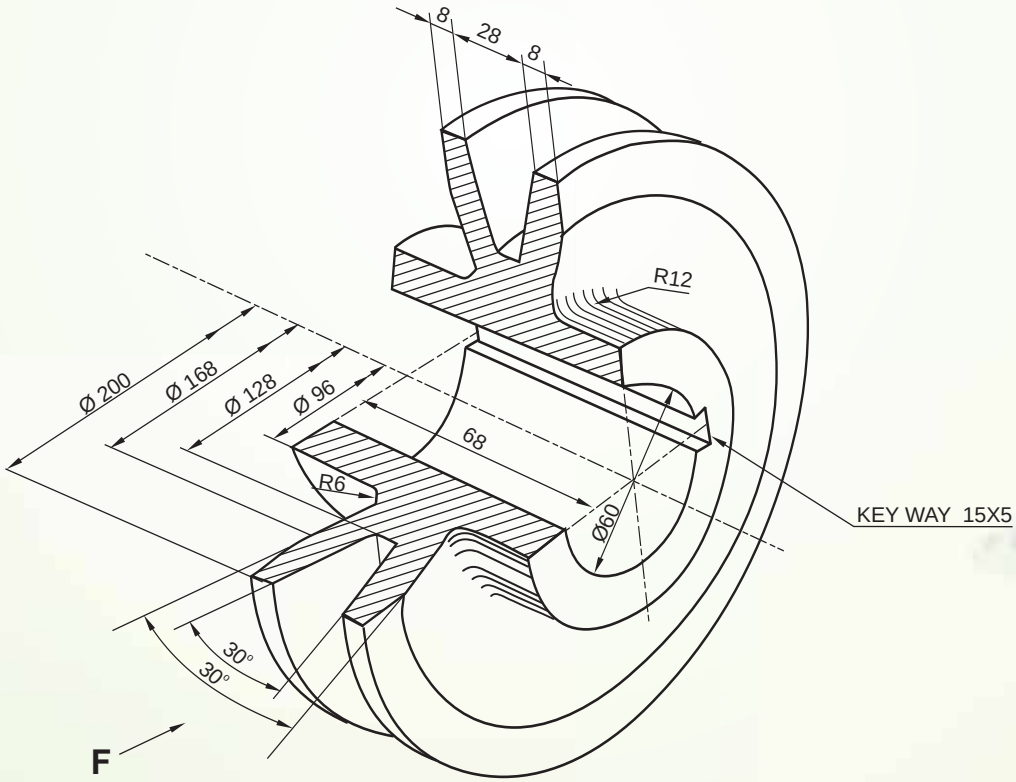
Write title and scale used. Draw projection symbol. Give '6' important dimensions.

7.3 V- BELT PULLEY:

In the V- belt pulley, there is a wedge shaped groove (V- groove) provided on the rim of pulley to carry the belt of V- shaped cross section. These are extensively used in our daily life as well as in industries due to the high efficiency in power transmission.

The endless belt of V- shape are specially made of rubber and fibre to withstand high tensile force. In general, a groove of 40° is selected. But it must be adjusted in relation to the pulley diameter. The pictorial view of a V- belt pulley with single groove is shown in Fig 7.8. Detail of the V-groove along with the section are also shown in the figure for better understanding of it.

V- BELT PULLEY
Fig 7.7



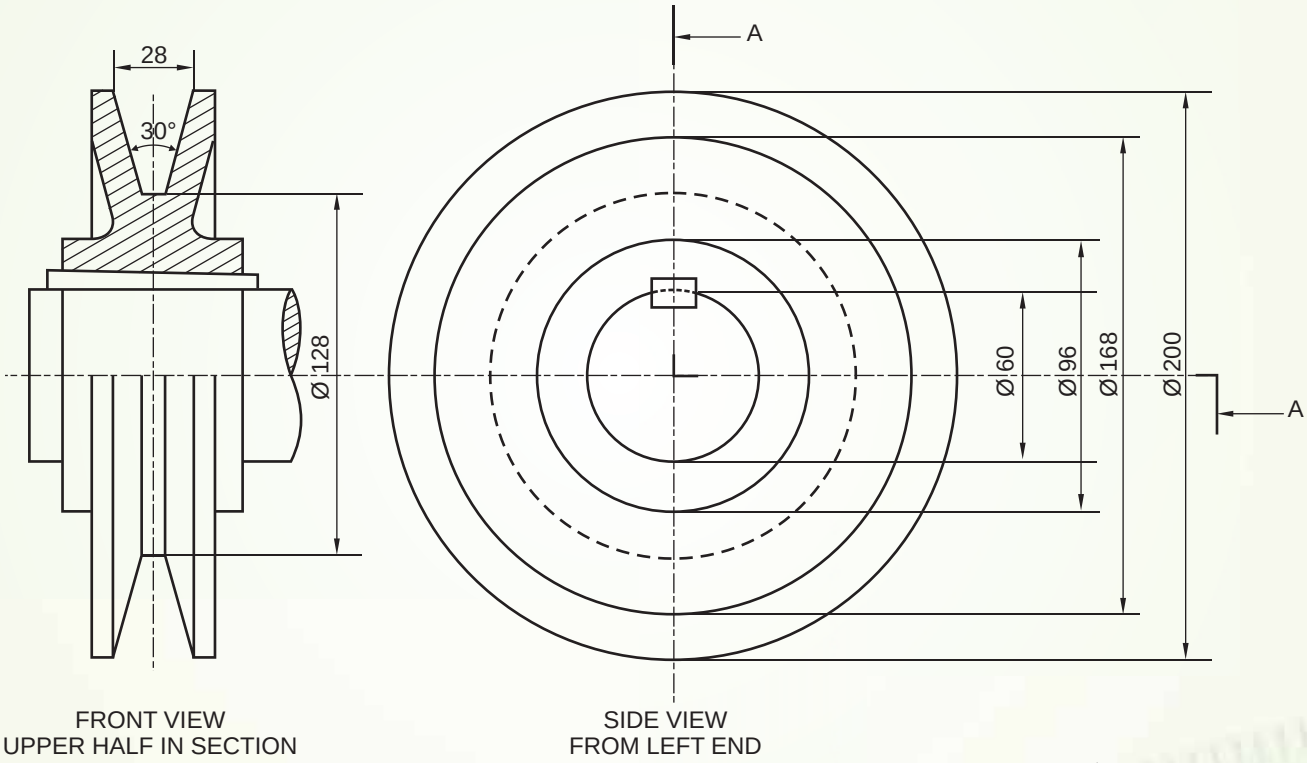
SINGLE GROOVE V-BELT PULLEY
Fig 7.8

Example 3 :

Draw the Front View with upper half in section and Side View looking from left side for the Assembly of pulley shown in Fig. 7.8 with shaft and key of proper size.

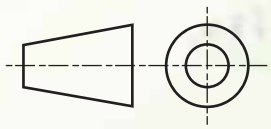
Write title and scale used. Draw projection symbol. Give '6' important dimensions.

Solution :



V - BELT PULLEY

Fig 7.9



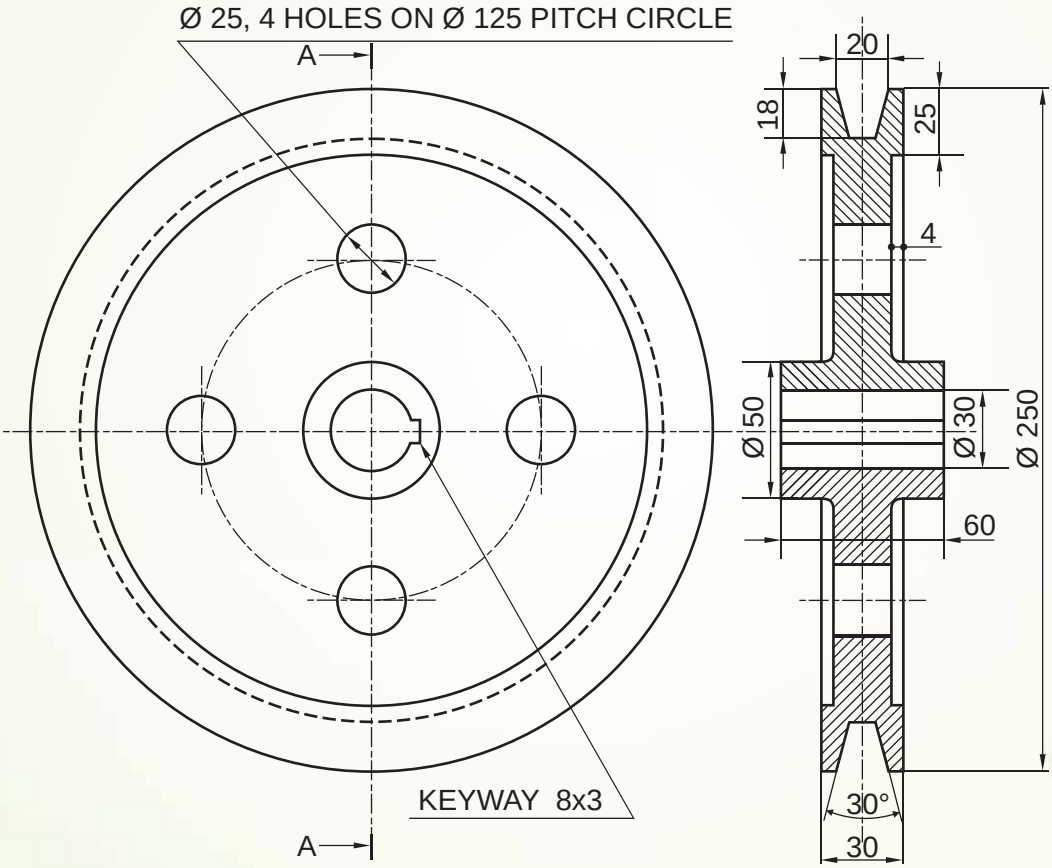
SCALE 1:2

EXERCISE 4 : Fig 7.10 shows the orthographic views of a single groove V-belt pulley. Draw its following views with shaft and key of proper size :

(i) Front View, upper half in section

(ii) Side View looking from left side.

Write title and scale used. Draw projection symbol. Give '6' important dimensions.



SINGLE GROOVE V - BELT PULLEY

Fig 7.10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