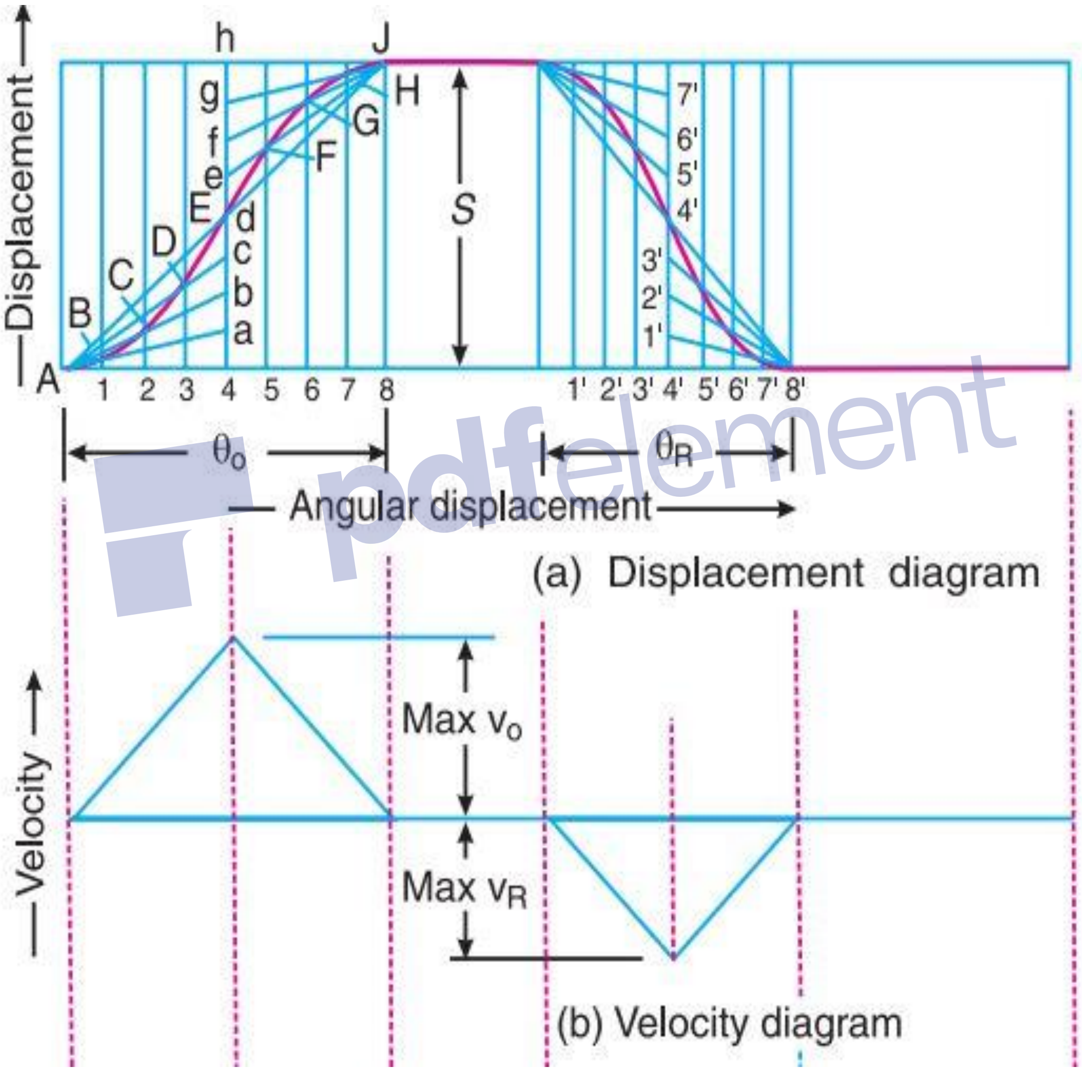
Displacement, Velocity and Acceleration Diagrams when the Follower Moves with Uniform Acceleration and Retardation

The displacement, velocity and acceleration diagrams when the follower moves with uniform acceleration and retardation are shown in Fig. (a), (b) and (c) respectively. We see that the displacement diagram consists of a parabolic curve and may be drawn as discussed below :

1. Divide the angular displacement of the cam during outstroke (Ο θ) into any even number of equal parts (say eight) and draw vertical lines through these points as shown in Fig. (a).
2. Divide the stroke of the follower (S) into the same number of equal even parts.
3. Join Aato intersect the vertical line through point 1 at B. Similarly, obtain the other points C, Detc. as shown in Fig. (a). Now join these points to obtain the parabolic curve for the out stroke of the follower.
4. In the similar way as discussed above, the displacement diagram for the follower during return stroke may be drawn.



(a) Displacement diagram

(b) Velocity diagram

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A cam is to give the following motion to a knife-edged follower :
1. Outstroke during 60° of cam rotation ; 2.Dwell for the next 30° of cam rotation ;
3.Return stroke during next 60° of cam rotation, and 4.Dwell for the remaining 210° of cam rotation. The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when
(a)the axis of the follower passes through the axis of the cam shaft, and
(b)the axis of the follower is offset by 20 mm from the axis of the cam shaft.

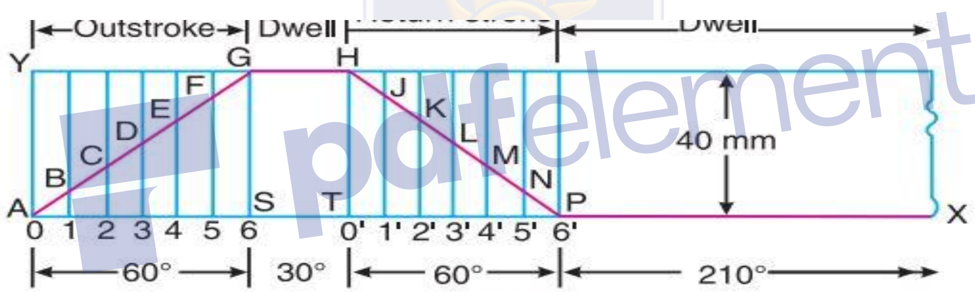

Fig. 20.10

First of all, the displacement diagram, as shown in Fig. 20.10, is drawn as discussed in the following steps :

1. Draw a horizontal line $AX = 360°$ to some suitable scale. On this line, mark $AS = 60°$ to represent outstroke of the follower, $ST = 30°$ to represent dwell, $TP = 60°$ to represent return stroke and $PX = 210°$ to represent dwell.
2. Draw vertical line AY equal to the stroke of the follower (*i.e.* 40 mm) and complete the rectangle as shown in Fig. 20.10.
3. Divide the angular displacement during outstroke and return stroke into any equal number of even parts (say six) and draw vertical lines through each point.
4. Since the follower moves with uniform velocity during outstroke and return stroke, therefore the displacement diagram consists of straight lines. Join AG and HP.
5. The complete displacement diagram is shown by $AGHPX$ in Fig. 20.10.

1. Draw a base circle with radius equal to the minimum radius of the cam (i.e.50 mm) with Oas centre.

2. Since the axis of the follower passes through the axis of the cam shaft, therefore mark trace point A, as shown in Fig. 20.11.

3. From OA, mark angle AOS= 60° to represent outstroke, angle SOT= 30° to represen dwell and angle TOP= 60° to represent return stroke.

4. Divide the angular displacements during outstroke and return stroke (i.e.angle AOSand angle TOP) into the same number of equal even parts as in displacement diagram.

5. Join the points 1, 2, 3 ...etc. and 0′,1′, 2′ , 3′, ... etc. with centre Oand produce beyond the base circle as shown in Fig. 20.11.

6. Now set off 1B, 2C, 3D... etc. and 0′H,1′J... etc. from the displacement diagram.

7. Join the points A, B, C,... M, N, Pwith a smooth curve. The curve AGHPAis the complete

profile of the cam.