8. Join the points *A, B, C ...M, N, P* with a smooth curve. The curve *AGHPA* is the complete profile of the cam.

Example 2. *A cam is to be designed for a knife edge follower with the following data* :

1. *Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion.*

2. *Dwell for the next 30°.*

3. *During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion.*

4. *Dwell during the remaining 180°. Draw the profile of the cam when*

(a) *the line of stroke of the follower passes through the axis of the cam shaft, and*

(b) *the line of stroke is offset 20 mm from the axis of the cam shaft. The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.*

Solution. *Given: S = 40 mm = 0.04 m; θ_O = 90° = π /2 rad = 1.571 rad; θ_R = 60° = π /3 rad = 1.047 rad; N = 240 r.p.m.*

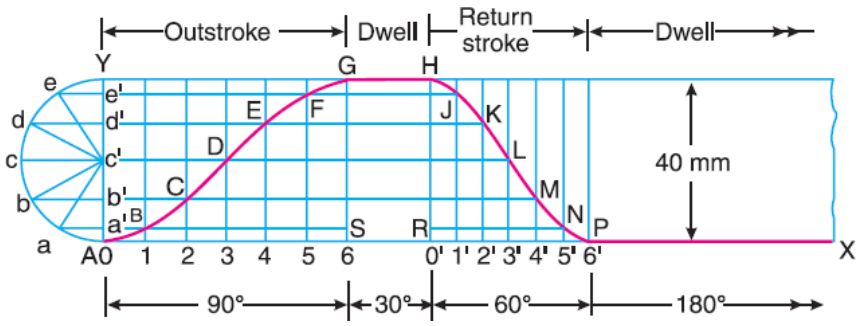

Figure 1

First of all, the displacement diagram, as shown in Figure 1, is drawn as discussed in the following steps:

1. Draw horizontal line *AX* = 360° to some suitable scale. On this line, mark *AS* = 90° to represent out stroke; *SR* = 30° to represent dwell; *RP* = 60° to represent return stroke and *PX* = 180° to represent dwell.

2. Draw vertical line *AY* = 40 mm to represent the cam lift or stroke of the follower and complete the rectangle as shown in Figure 1.

3. Divide the angular displacement during out stroke 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 simple harmonic motion, therefore draw a semicircle with *AY* as diameter and divide into six equal parts.

5. From points *a*, *b*, *c* ... etc. draw horizontal lines intersecting the vertical lines drawn through 1, 2, 3 ... etc. and 0′ ,1′, 2′ ...etc. at *B*, *C*, *D* ... *M*, *N*, *P*.

6. Join the points *A*, *B*, *C* ... etc. with a smooth curve as shown in Figure 1. This is the required displacement diagram.

(a) Profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft

The profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft, as shown in Figure 2, is drawn in the similar way as is discussed in Example 1.

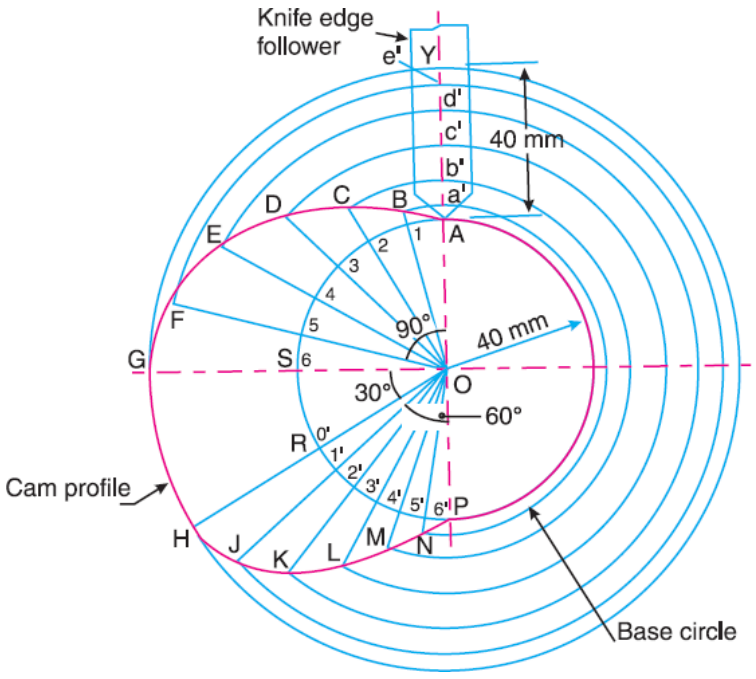

Figure 2

(b) Profile of the cam when the line of stroke of the follower is offset 20 mm from the axis of the cam shaft

The profile of the cam when the line of stroke of the follower is offset 20 mm from the axis of the cam shaft, as shown in Figure 2, is drawn in the similar way as discussed in Example 1.

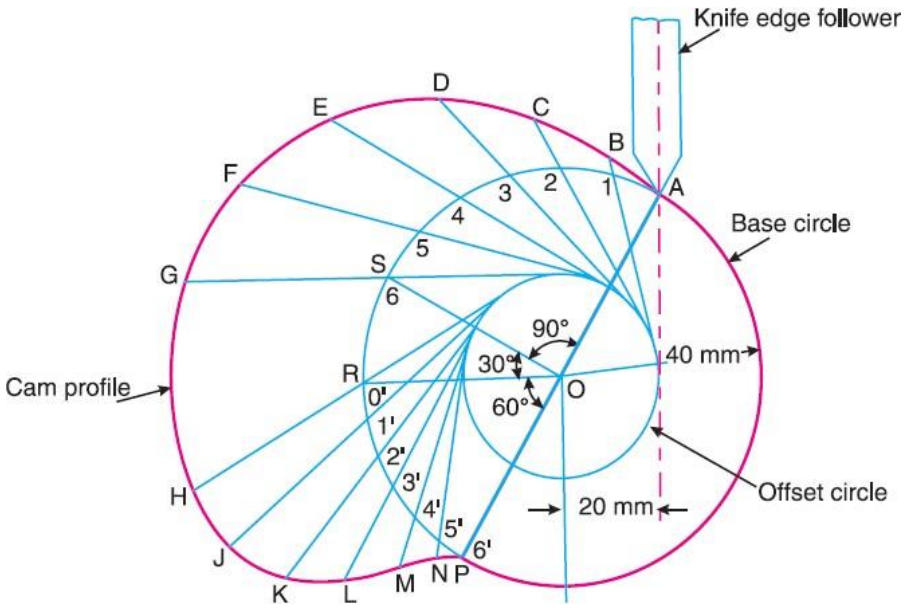
Knife edge follower
Base circle
Cam profile
Offset circle
40 mm
20 mm
90°
30°
60°
A
B
C
D
E
F
G
H
J
K
L
M
N
P
R
S
O
1
2
3
4
5
6
0'
1'
2'
3'
4'
5'
6'

Figure 3.