$$a_{max} = \frac{\pi^2 \times \omega^2 \times s}{2 \times (\theta^0)^2} = \frac{\pi^2 \times 5\pi^2 \times 35}{2 \times (90 \times \frac{\pi}{180})^2} = 17.272 \ m/s^2$$

A cam is to give the following motion to the knife-edged follower:

To raise the follower through 30 mm with uniform acceleration and deceleration during 120º rotation of the cam

Dwell for the next 30º of the cam rotation

To lower the follower with simple harmonic motion during the next 90º rotation of the cam

Dwell for the rest of the cam rotation

The cam has minimum radius of 30 mm and rotates counter-clockwise at a uniform speed of 800 rpm. Draw the profile of the cam if the line of stroke of the follower passes through the axis of the cam shaft.

– S = 30 mm : Øa = 120º ; N = 800 rpm ;
– $\delta_1 = 30°$; r_c = 30 mm : $Ø_d$ = 90º;
– **During ascent:**

$$\omega = \frac{2\pi N}{60} = \frac{2\pi \times 840}{60} = 88 \frac{rad}{s}$$

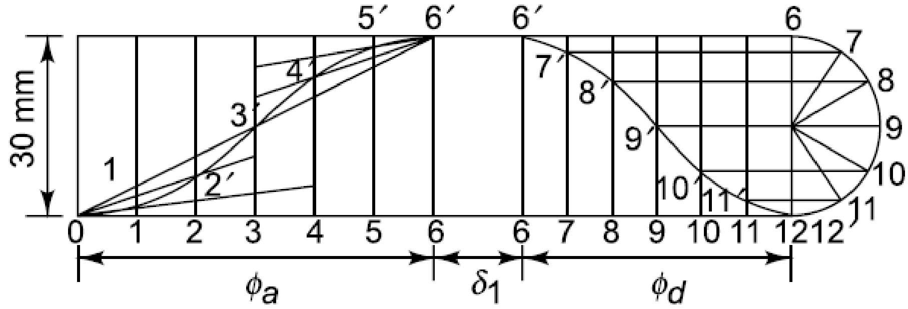
$$v_{max} = \frac{2 \times 88 \times 0.03}{120 \times \frac{\pi}{180}} = 2.52 \ m/s$$

$$a_0 = \frac{4\omega^2 . S}{(\ )^2} = \frac{4\ 88^2 \times 0.03}{(120 \times \frac{\pi}{180})^2} = 211.9 \ m/s^2$$

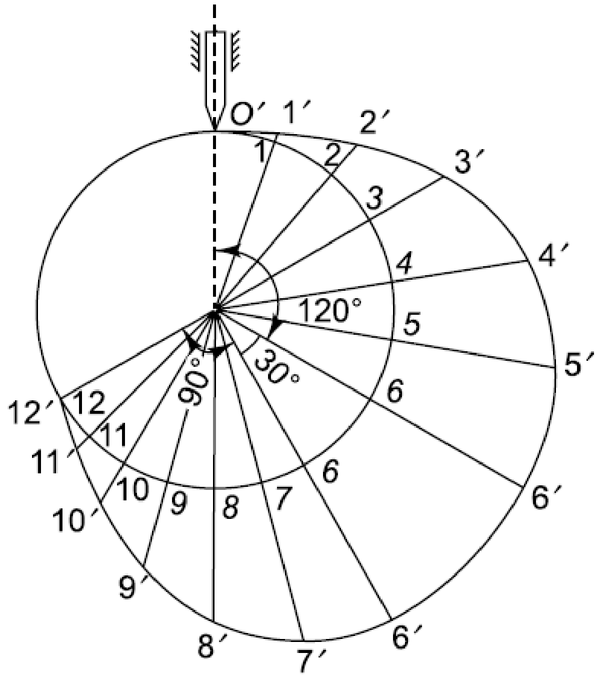
– **During descent:**

$$v_{max} = \frac{\pi \times \ \times s}{\theta_0 \ 2} = \frac{\pi \times 88 \times 0.03}{2 \times 90 \times \frac{\pi}{180}} = 2.64\ mm/s$$

$$a_{max} = \frac{\pi^2 \times \omega^2 \times s}{2 \times (\theta_0\ )^2} = \frac{\pi^2 \times 88^2 \times 0.03}{2 \times (90 \times \frac{\pi}{180})^2} = 467.6 \ m/s^2$$



(a)



(b)

Fig. 7.12

Draw the profile of a cam operating a roller reciprocating follower and with the following data:

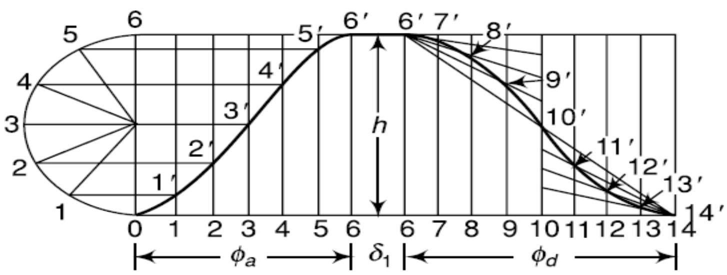
Minimum radius of cam = 25 mm

Lift = 30 mm

Roller diameter = 15 mm

The cam lifts the follower for 120^0 with SHM followed by a dwell period of 30^0. Then the follower lowers down during 150^0 of the cam rotation with uniform acceleration and deceleration followed by dwell period. If the cam rotates at a uniform speed of 150 rpm. Calculate the maximum velocity and acceleration of the follower during the descent period.

- S = 30 mm : Øa = 120^0 ; N = 150 rpm ;$Ø_d$ = 150^0
- $\delta_1 = 30°$; r_c = 25 mm : $\delta_2 = 60°$; r_r = 7.5 mm



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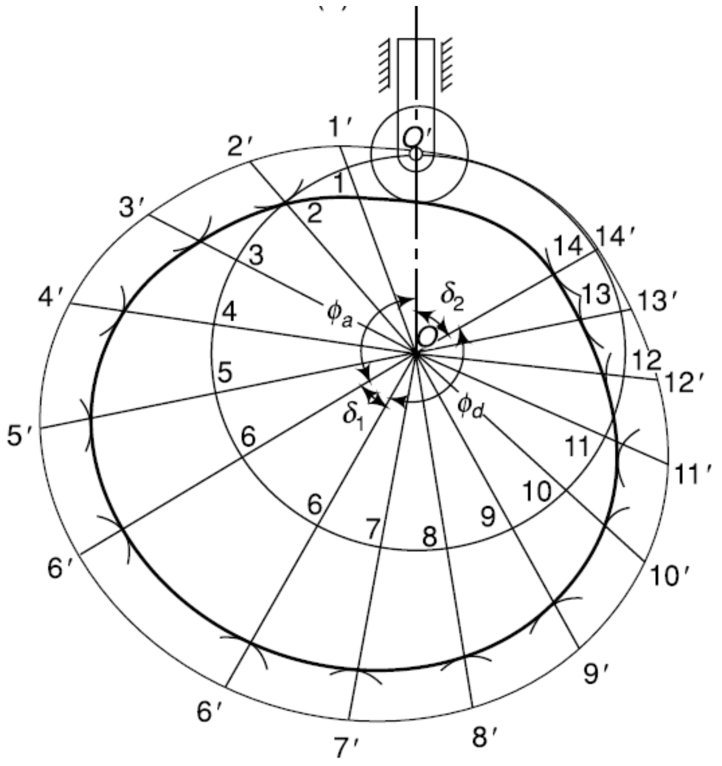


(b)

Fig. 7.13

$$v_{max} = \frac{2 \times s \times \omega}{\varphi_d}$$

$$v_{max} = \frac{2 \times 30 \times \frac{2\times\pi\times150}{60}}{150 \times \frac{\pi}{180}} = 360\, m/s$$

$$f_{max} = \frac{4 \times S \times \omega^2}{(\varphi_d)^2}$$

$$f_{max} = \frac{4 \times 30 \times \left(\frac{2\times\pi\times150}{60}\right)^2}{\left(150 \times \frac{\pi}{180}\right)^2} = 4320\, mm/s^2$$

The following data relate to a cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent.

Minimum radius of cam = 25 mm

Roller diameter = 7.5 mm

Lift = 28 mm

Offset of follower axis = 12 mm towards right

Angle of ascent = 60º

Angle of descent = 90º

Angle of dwell between ascent and descent = 45º

Speed of cam = 200 rpm

Draw the profile of the cam and determine the maximum velocity and the uniform acceleration of the follower during the outstroke and the return stroke.

- S = 28 mm : Øa = 60º ; N = 200 rpm ;Ød = 90º
- $\delta_1 = 45°$; r_c = 25 mm : $\delta_2 = 165°$; r_r = 7.5 mm; x = 12 mm

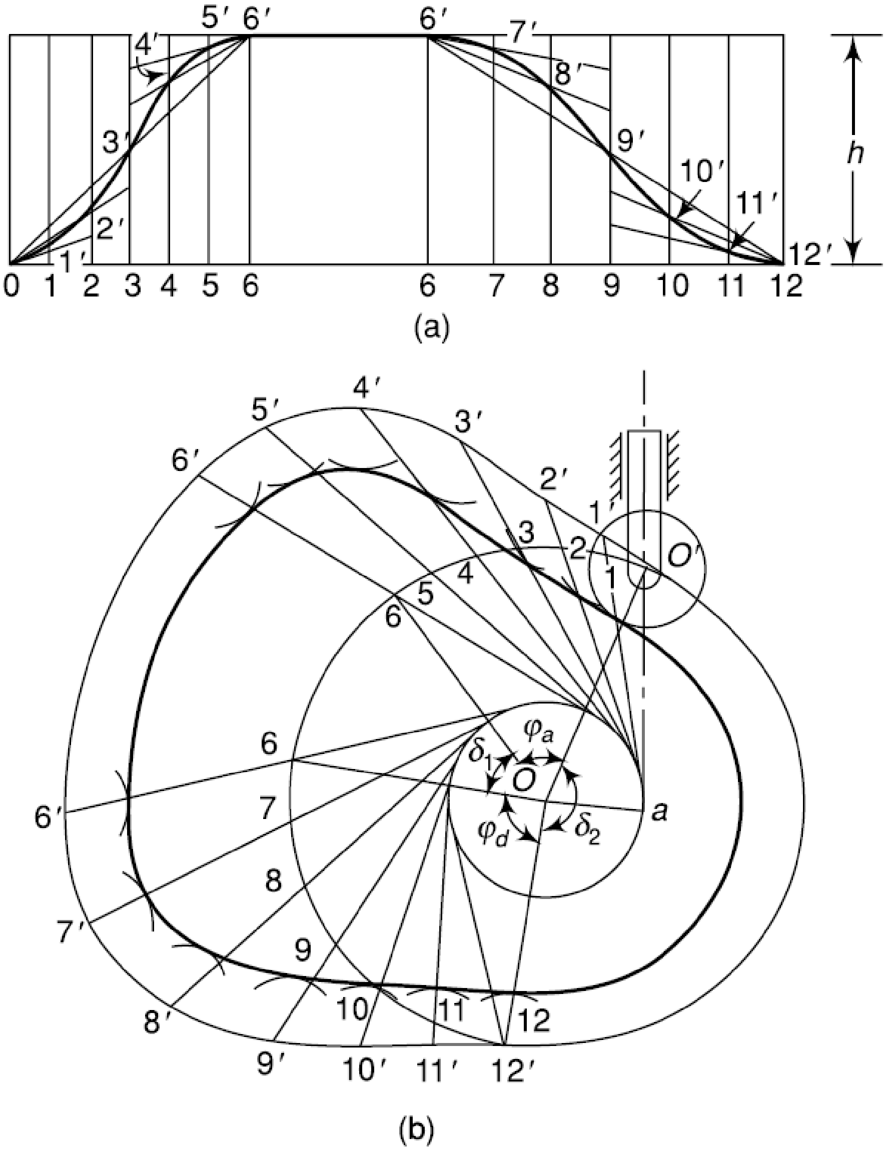


Fig. 7.14

- **During outstroke:**

$$v_{max} = \frac{2 \times s \times \omega}{\varphi_d}$$

$$v_{max} = \frac{2 \times 28 \times 20.94}{60 \times \frac{\pi}{180}} = 1.12\ m/s$$

$$f_{max} = \frac{4 \times S \times \omega^2}{(\varphi_d)^2}$$

$$f_{max} = \frac{4 \times 30 \times (20.94)^2}{\left(60 \times \frac{}{180}\right)^2} = 44800\ mm/s^2$$

– **During Return stroke:**

$$v_{max} = \frac{2 \times s \times \omega}{\varphi_d}$$

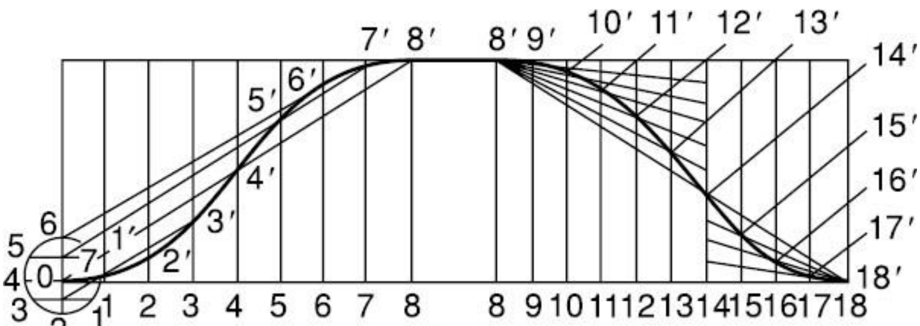
$$v_{max} = \frac{2 \times 28 \times 20.94}{90 \times \frac{\pi}{180}} = 0.747\ m/s$$

$$f_{max} = \frac{4 \times S \times \omega^2}{(\varphi_d)^2}$$

$$f_{max} = \frac{4 \times 30 \times (20.94)^2}{\left(90 \times \frac{}{180}\right)^2} = 19900\ mm/s^2$$

A flat-faced mushroom follower is operated by a uniform rotating cam. The follower is raised through a distance of 25 mm in 120º rotation of the cam, remains at rest for next 30º and is lowered during further 120º rotation of the cam. The raising of the follower takes place with cycloidal motion and the lowering with uniform acceleration and deceleration. However, the uniform acceleration is 2/3 of the uniform deceleration. The least radius of the cam is 25 mm which rotates at 300 rpm.
Draw the cam profile and determine the values of the maximum velocity and maximum acceleration during rising and maximum velocity and uniform acceleration and deceleration during lowering of the follower.

– S = 30 mm : Øa = 60º ; N = 200 rpm ;$Ø_d$ = 90º
– $\delta_1 = 45°$; r_c = 25 mm : $\delta_2 = 165°$; r_r = 7.5 mm; x = 12 mm
–



(a)

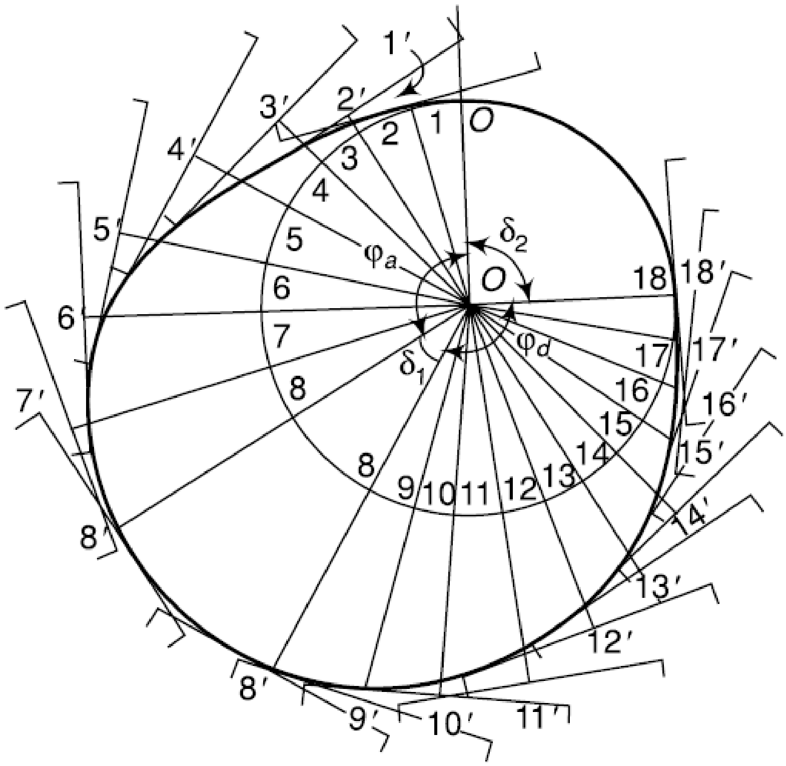


Fig. 7.15

– **During ascent:**

$$v_{max} = \frac{2 \times s \times \omega}{\varphi_a}$$

$$v_{max} = \frac{2 \times 25 \times 31.4}{120 \times \frac{\pi}{180}} = 0.75\,\frac{m}{s}$$

$$f_{max} = \frac{4 \times S \times \omega^2}{(\varphi_a)^2}$$

$$f_{max} = \frac{4 \times 30 \times (31.4)^2}{\left(120 \times \frac{\pi}{180}\right)^2} = 35310\,\frac{mm}{s^2}$$

The following data relate to a cam operating an oscillating an oscillating roller follower:

Minimum radius of cam = 44
mm Dia. Of roller = 14 mm
Length of the arm = 40
mm Distance from fulcrum
Centre from cam center = 50
mm Angle of ascent = 75º
Angle of descent = 105º
Angle of dwell in

Highest position = 60^o
Angle of oscillation of
Follower = 28^o
Draw the profile of the cam if the ascent and descent both take place with SHM.

- S = 19.5 mm : $Ø_a = 75^o$; $Ø_d = 105^o$
- $\delta_1 = 60°$; r_c = 22 mm : $\delta_2 = 120°$; r_r = 7.5 mm;

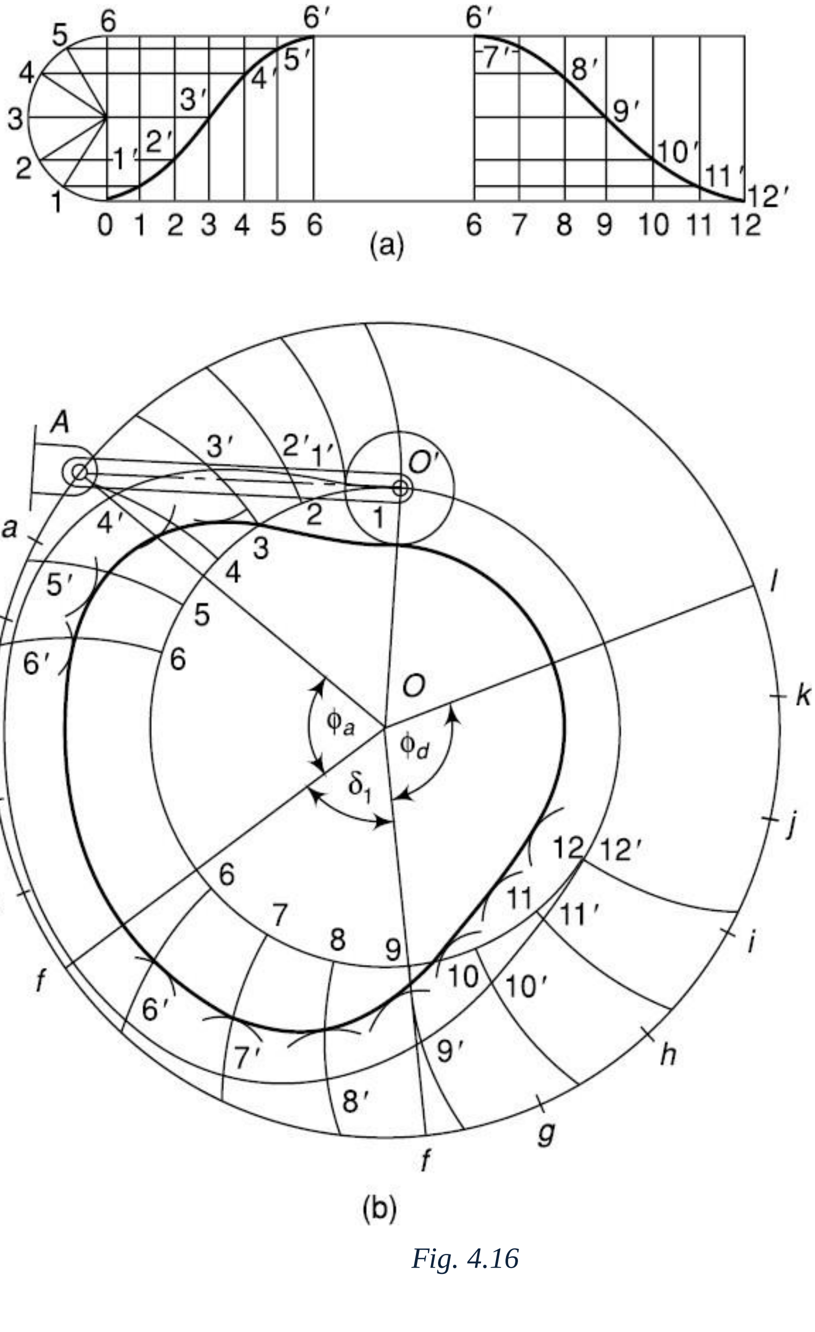


Fig. 4.16

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2. Theory of Machines by R.S. Khurmi & J.K.Gupta,S.Chand