DRONACHARYA GROUP OF INSTITUTIONS, GREATER NOIDA

Mechanical Engineering Department

Unit III

Q-1 Differentiate between the following with neat sketches:- i) Base circle and Prime circle. ii) Cam angle and Pressure angle.
iii) Pitch point and Trace point. iv) Period of ascent and period of descent. v) Disc cams and cylindrical cams.

Q-2 Draw the displacement, velocity and acceleration diagrams for a follower when it moves with uniform velocity. Also draw the modified displacement, velocity and acceleration diagrams. Why modifications in these diagrams are necessary?

Q-3 Discuss the acceleration, velocity and displacement response of followers for the following types of cam:
(i) Parabolic cam (ii) simple harmonic cam

Q-4 What is cam? With the help of neat sketches, describe various types of cams.

Q-5 Sketch and describe the different types of followers which are used with radial or disc cams. Discuss the advantages and disadvantages of each type.

Q-6 Draw the profile of a cam operating a knife edge follower when the axis of the follower passes through the axis of a cam shaft from the following data
a) Follower to move outwards through 40 mm during 60 ^{o} of cam rotation. b) Follower to dwell for the next 45 ^{o}.
c) Follower to return to its original position during next 90 ^{o}. d) Follower to dwell for the rest of the cam rotation.
The displacement of the follower is to take place with S.H.M. during outward and return strokes. The least radius of cam is 50 mm. If the cam rotates at 300 rpm, determine the maximum velocity and acceleration of the follower during the outward and return strokes.
If in the above problem the axis of the follower is not passing through the axis of cam shaft but is offset by 20 mm from the axis of the cam shaft, then draw the profile of cam. All other data are same.

Q-7 Draw the profile of a cam operating a roller follower with the following data.
Minimum radius of cam = 25 mm, Lift = 30 mm, Roller diameter = 25 mm. The cam lifts the follower for 120 ^{o} with SHM followed by a dwell period of 30 ^{o}. Then the follower lowers down during 150 ^{o} of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the follower during descent period.

Q- 8 A flat faced mushroom follower is operated by a uniformly rotating cam. The follower is raised through a distance of 25 mm in 120 ^{o} rotation of the cam, remains at rest for the next 30 ^{o} and is lowered during further 120 ^{o} rotation of the cam. The raising of the follower takes place with cycloid motion and lowering with uniform acceleration and deceleration . The least radius of the cam is 25 mm which rotates 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 during lowering of the follower.

Q-9 The following data relate to a cam operating an oscillating roller follower.
Minimum radius of cam = 22 mm, Diameter of roller = 14 mm, Length of the follower arm = 40 mm, Distance of fulcrum centre from cam centre = 50 mm, Angle of ascent = 75 ^{o}, Angle of descent = 105 ^{o}, Angle of dwell for follower in the 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.

Q-10 Derive the expression for the displacement, velocity and acceleration for a circular arc cam operating a flat-faced follower:
(i) When the contact is on the circular flank and
(ii) When the contact is on the circular nose.

Q-11 What are the advantages of cam profiles consisting of circular arcs and straight lines?
Discuss the important cams of specified contours. For the tangent cam with circular nose and roller follower, derive the expression of the velocity of the follower:
(i) when roller is in contact with straight flank'
(ii) When roller is in contact with circular nose.

Q-12 A tangent cam with a base circle diameter of 50 mm operates a roller follower 20 mm in diameter. The line of stroke of the roller follower 30 mm in diameter. The line of stroke of the roller follower passes through the axis of the cam. The angle between the tangential faces of the cam in 60 °, speed of the cam shaft 200 rpm and the lift of the follower 15 mm. Calculate

(i) The main dimensions of cam (ii) The acceleration of the follower at

a) Beginning of lift, b) where the roller just touches the nose c) the apex of the circular nose.

Q-13 A follower satisfies following requirements:--

Stroke of the follower 2.5 cm; Outstroke S.H.M. for 90 °; in stroke S.H.M. for 80 °; Dwell at minimum lift 35 °. Draw the velocity- time and acceleration – time diagram. Determine the maximum velocity and maximum acceleration during the out stroke. The cam rotates at 1000 rpm.

Q- Draw the profile of cam to give the following motion to a roller follower:

(i) Outstroke during 60 ° of cam rotation S.H.M.

(ii) Dwell for 10 ° of cam rotation

(iii)Return stroke for 60 ° of cam rotation with constant velocity.

(iv) Dwell for remaining 230 ° of cam rotation.

(v) Stroke 10 mm and base radius 10 mm

Q-14 *Establish a relation between pressure angle, distance of the location of the follower from the cam centre and the angle of rotation of a cam for a cam follower mechanism with roller follower. Assume the follower to be an offset translating follower.*

Q-15 *A cam rotating at 150 rpm operates a reciprocating roller follower of radius 2.5 cm. the follower axis a offset by 2.5 cm to the right. The least radius of the cam is 5 cm. and the stroke of the3 follower is 5 cm. Ascent and descent both take place by uniform acceleration and retardation. Ascent takes place duiring 75 ° and descent during 90 °i of cam rotations. Dwell between ascent and descent is 60 °. Draw velocity and acceleration diagrams.*