

Mecanismos

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Cames

Análise de cames circulares

Análise de cames circulares

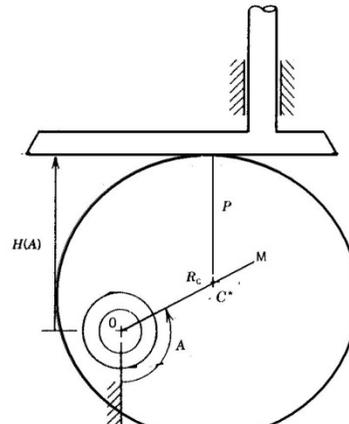


FIGURE 4.22 Eccentric Arc Cam with Flat-faced Translating Follower

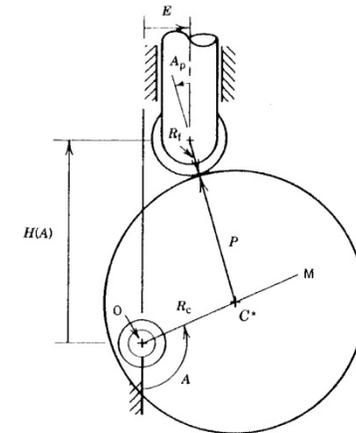


FIGURE 4.23 Full Circle Eccentric Cam with Offset Translating, Roller Follower

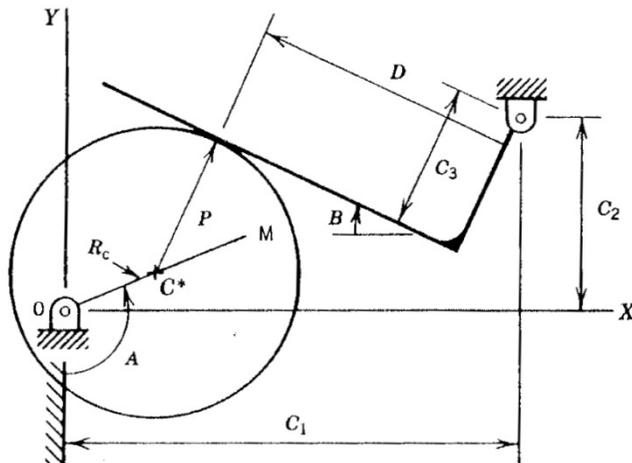


FIGURE 4.24 Full Circle Eccentric Cam with Oscillating Flat-faced Follower

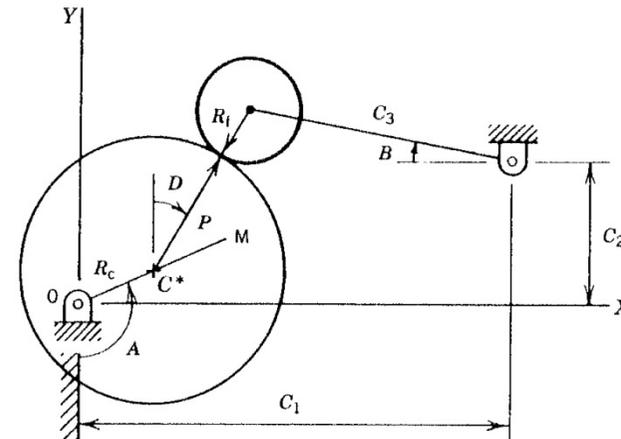


FIGURE 4.25 Full Circle Eccentric Cam with Pivoted, Roller Follower

- Análise de cames circulares com seguidor de translação e oscilante

- **posição, velocidade e aceleração do seguidor**

24/10/2018

Análise de cames circulares

Seguidor de translação

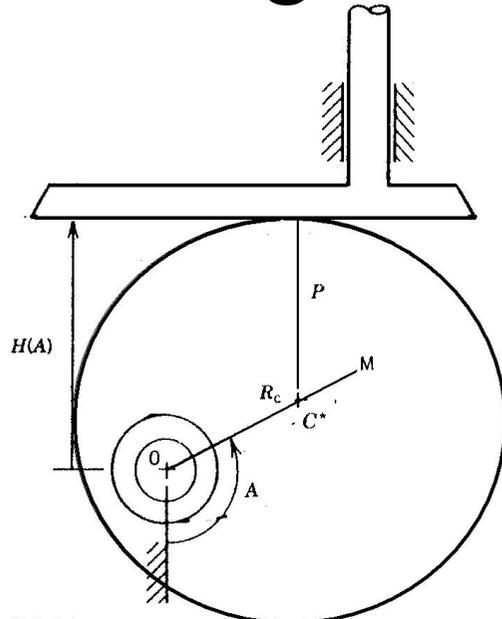


FIGURE 4.22 Eccentric Arc Cam with Flat-faced Translating Follower

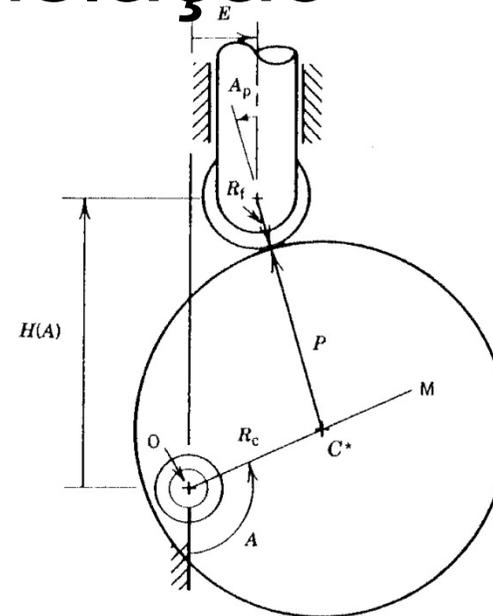


FIGURE 4.23 Full Circle Eccentric Cam with Offset, Translating, Roller Follower

$$H(A) = H(0) + f(A)$$

$$\dot{H}(A) = f'(A) \cdot \dot{A}$$

$$\ddot{H}(A) = f'(A) \cdot \ddot{A} + f''(A) \cdot \dot{A}^2$$

posição

velocidade

aceleração

Seguidor de translação de face plana

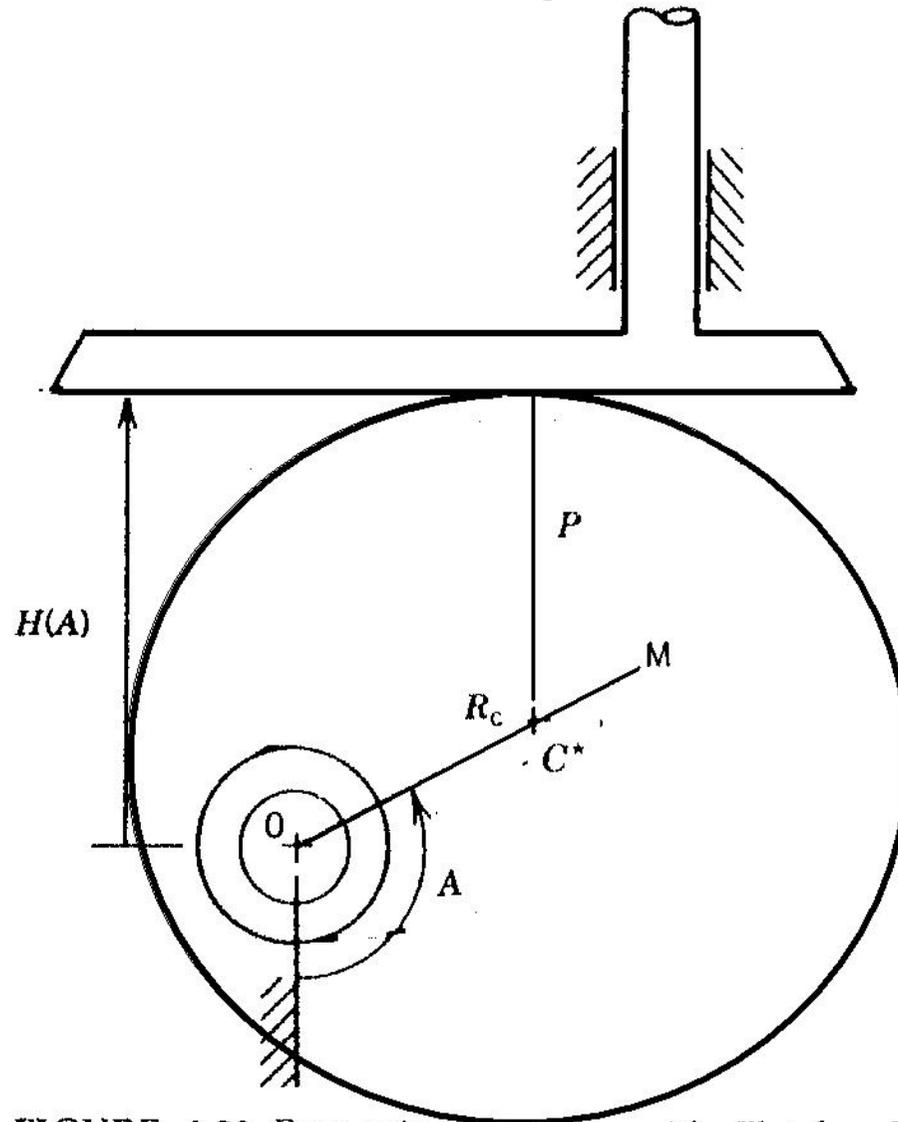


FIGURE 4.22 Eccentric Arc Cam with Flat-faced Translating Follower

Seguidor de translação de face plana

Posição

$$H(A) = P - R_C \cdot \cos(A)$$

$$H(0) = P - R_C$$

$$f(A) = H(A) - H(0)$$

$$f(A) = P - R_C \cdot \cos(A) - P + R_C = R_C \cdot (1 - \cos(A))$$

$$H(A) = \underbrace{P - R_C}_{H_0} + \underbrace{R_C \cdot (1 - \cos(A))}_{f(A)}$$

Velocidade

$$\dot{H}(A) = f'(A) \cdot \dot{A}$$

$$f'(A) = R_C \cdot \sin(A)$$

Aceleração

$$\ddot{H}(A) = f'(A) \cdot \ddot{A} + f''(A) \cdot \dot{A}^2$$

$$f''(A) = R_C \cdot \cos(A)$$

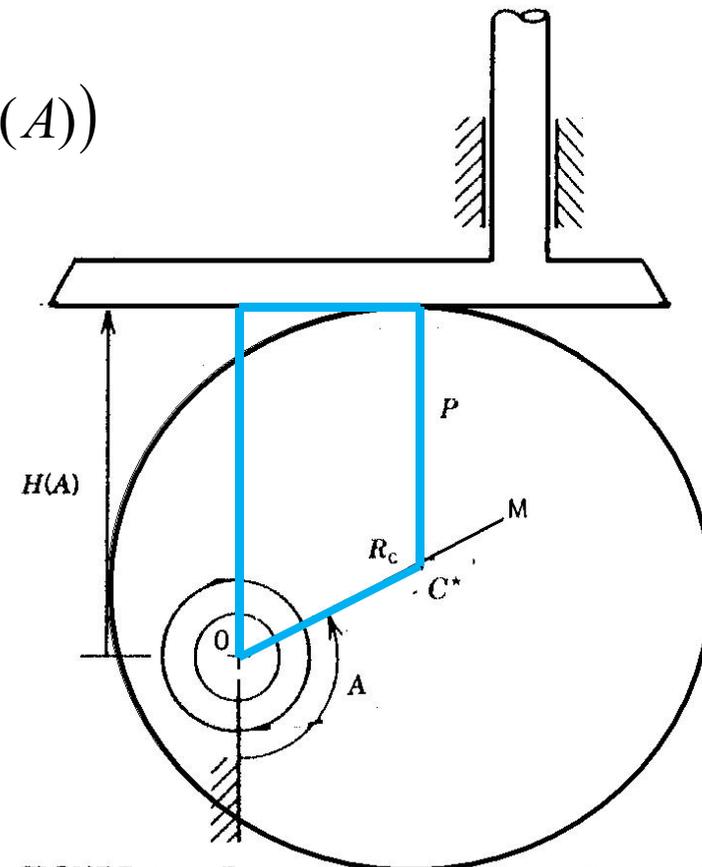


FIGURE 4.22 Eccentric Arc Cam with Flat-faced Translating Follower

Seguidor de translação com rolete

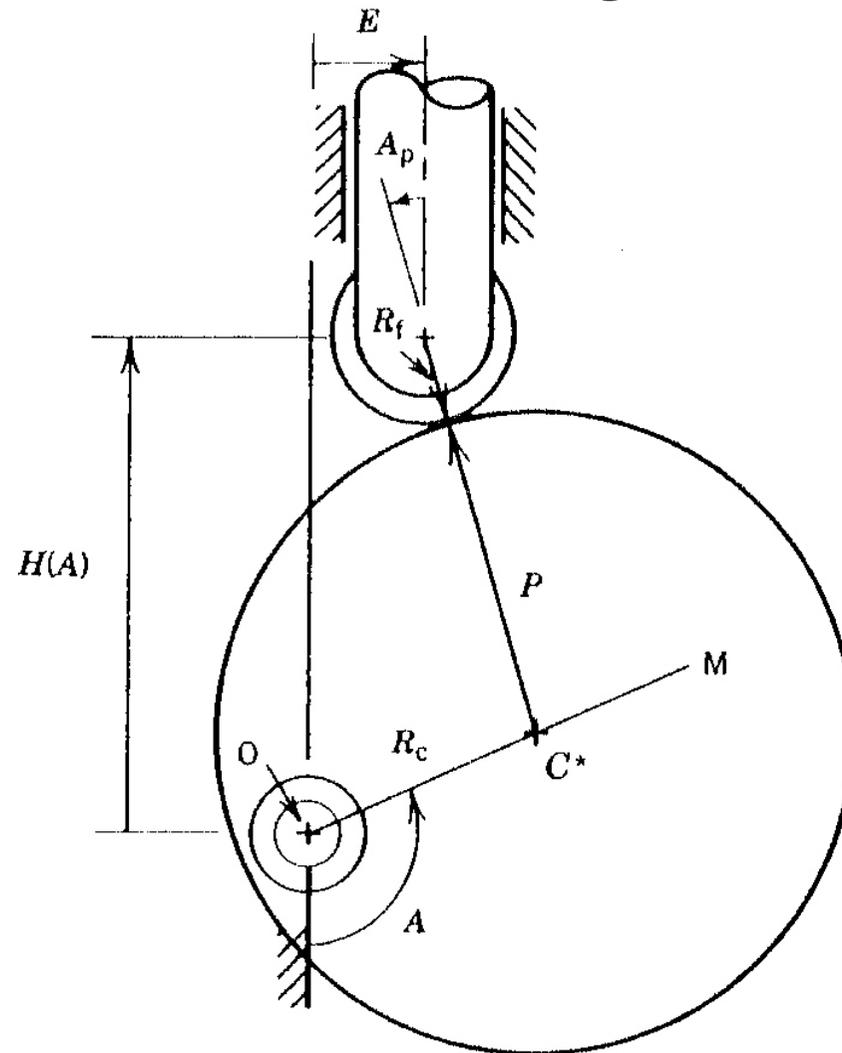


FIGURE 4.23 Full Circle Eccentric Cam with Offset, Translating, Roller Follower

Seguidor de translação com rolete

Posição

$$R_C \cdot \sin(A) - (R_f + P) \cdot \sin(A_p) - E = 0$$

$$-R_C \cdot \cos(A) + (R_f + P) \cdot \cos(A_p) - H(A) = 0$$

$$A_p = \arcsin \frac{R_C \cdot \sin(A) - E}{R_f + P}$$

$$H(A) = (R_f + P) \cdot \cos(A_p) - R_C \cdot \cos(A)$$

$$H(0) = (R_f + P) \cdot \cos(A_{p0}) - R_C$$

$$f(A) = H(A) - H(0)$$

$$f(A) = (R_f + P) \cdot (\cos(A_p) - \cos(A_{p0})) - R_C \cdot (\cos(A) - 1)$$

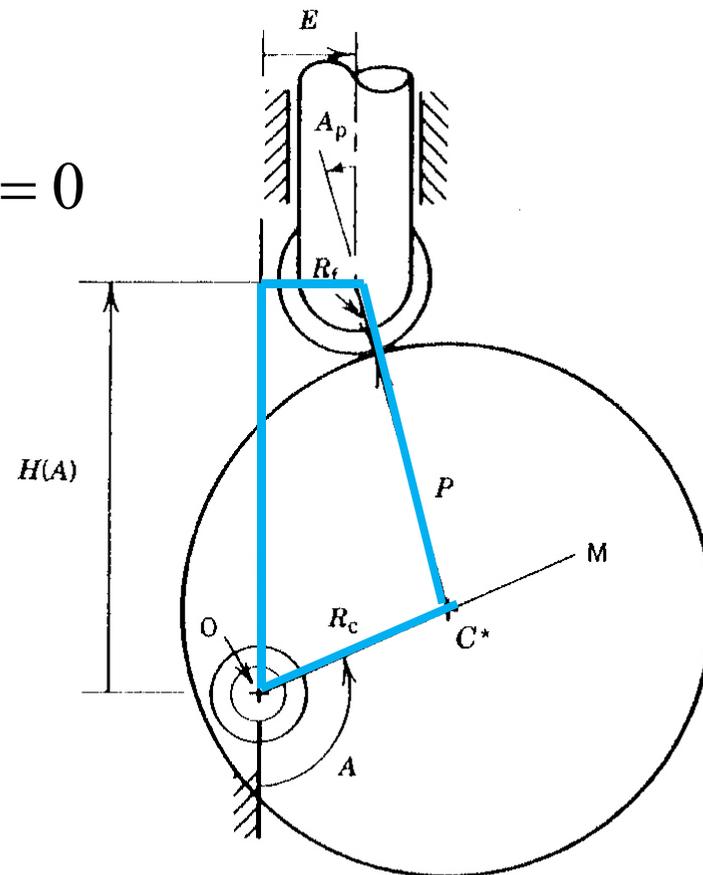


FIGURE 4.23 Full Circle Eccentric Cam with Offset, Translating, Roller Follower

Seguidor de translação com rolete

$$f(A) = (R_f + P) \cdot (\cos(A_p) - \cos(A_{p0})) - R_c \cdot (\cos(A) - 1)$$

Velocidade

$$\dot{H}(A) = f'(A) \cdot \dot{A}$$

$$f'(A) = (R_f + P) \cdot (-\sin(A_p) \cdot A'_p) + R_c \cdot \sin(A)$$

$$A'_p = \frac{R_c \cdot \cos(A) - E}{(R_f + P) \cdot \cos(A)}$$

$$f'(A) = R_c \cdot (\sin(A) - \cos(A) \cdot \tan(A_p))$$

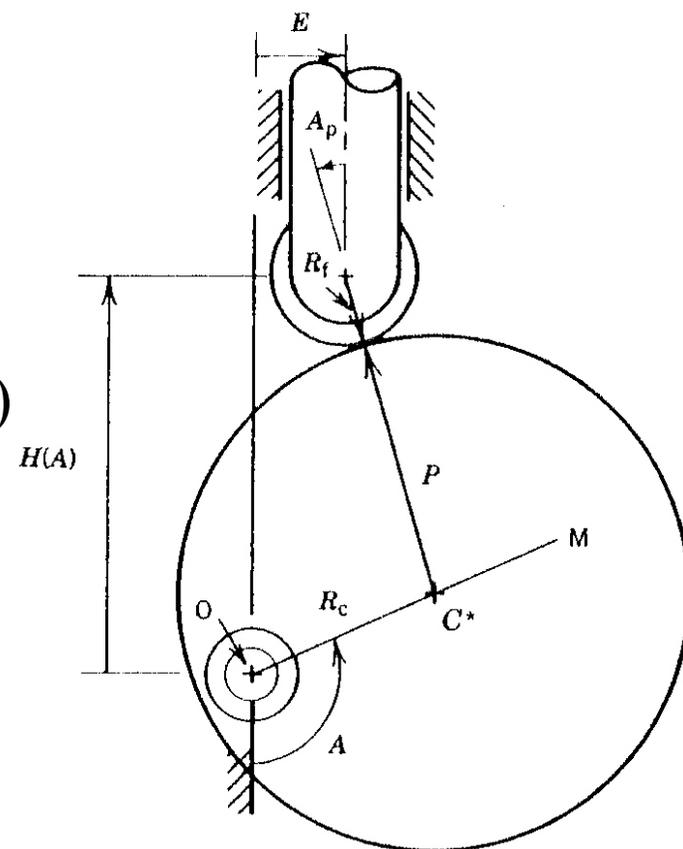


FIGURE 4.23 Full Circle Eccentric Cam with Offset, Translating, Roller Follower

Seguidor de translação com rolete

$$f'(A) = R_c \cdot (\sin(A) - \cos(A) \cdot \tan(A_p))$$

Aceleração

$$\ddot{H}(A) = f'(A) \cdot \ddot{A} + f''(A) \cdot \dot{A}^2$$

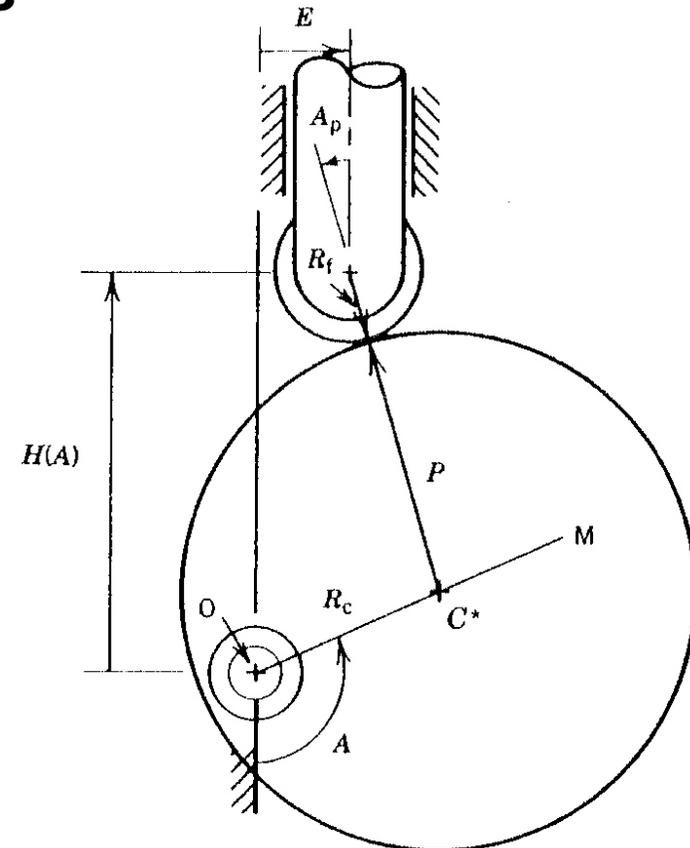


FIGURE 4.23 Full Circle Eccentric Cam with Offset, Translating, Roller Follower

$$f''(A) = R_c \cdot \left(\cos(A) + \sin(A) \cdot \tan(A_p) - \frac{R_c \cdot \cos^2(A)}{(R_f + P) \cdot \cos^3(A_p)} \right)$$

Seguidor oscilante

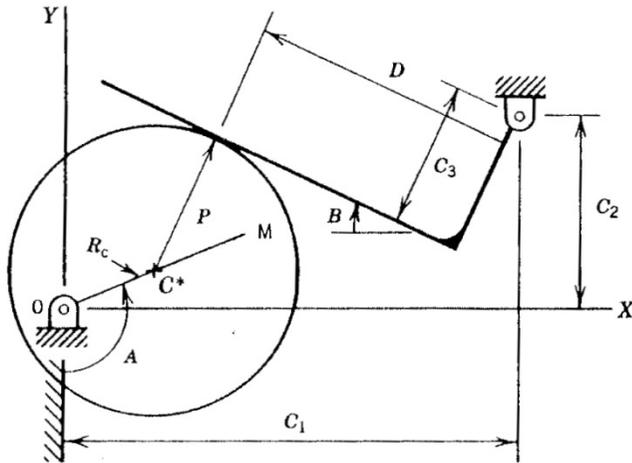


FIGURE 4.24 Full Circle Eccentric Cam with Oscillating Flat-faced Follower

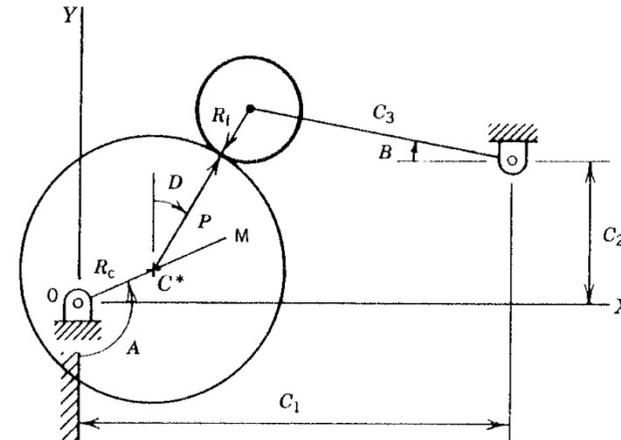


FIGURE 4.25 Full Circle Eccentric Cam with Pivoted, Roller Follower

$$B(A) = B(0) + f(A)$$

posição

$$\dot{B}(A) = f'(A) \cdot \dot{A}$$

velocidade

$$\ddot{B}(A) = f'(A) \cdot \ddot{A} + f''(A) \cdot \dot{A}^2$$

aceleração

Seguidor oscilante de face plana

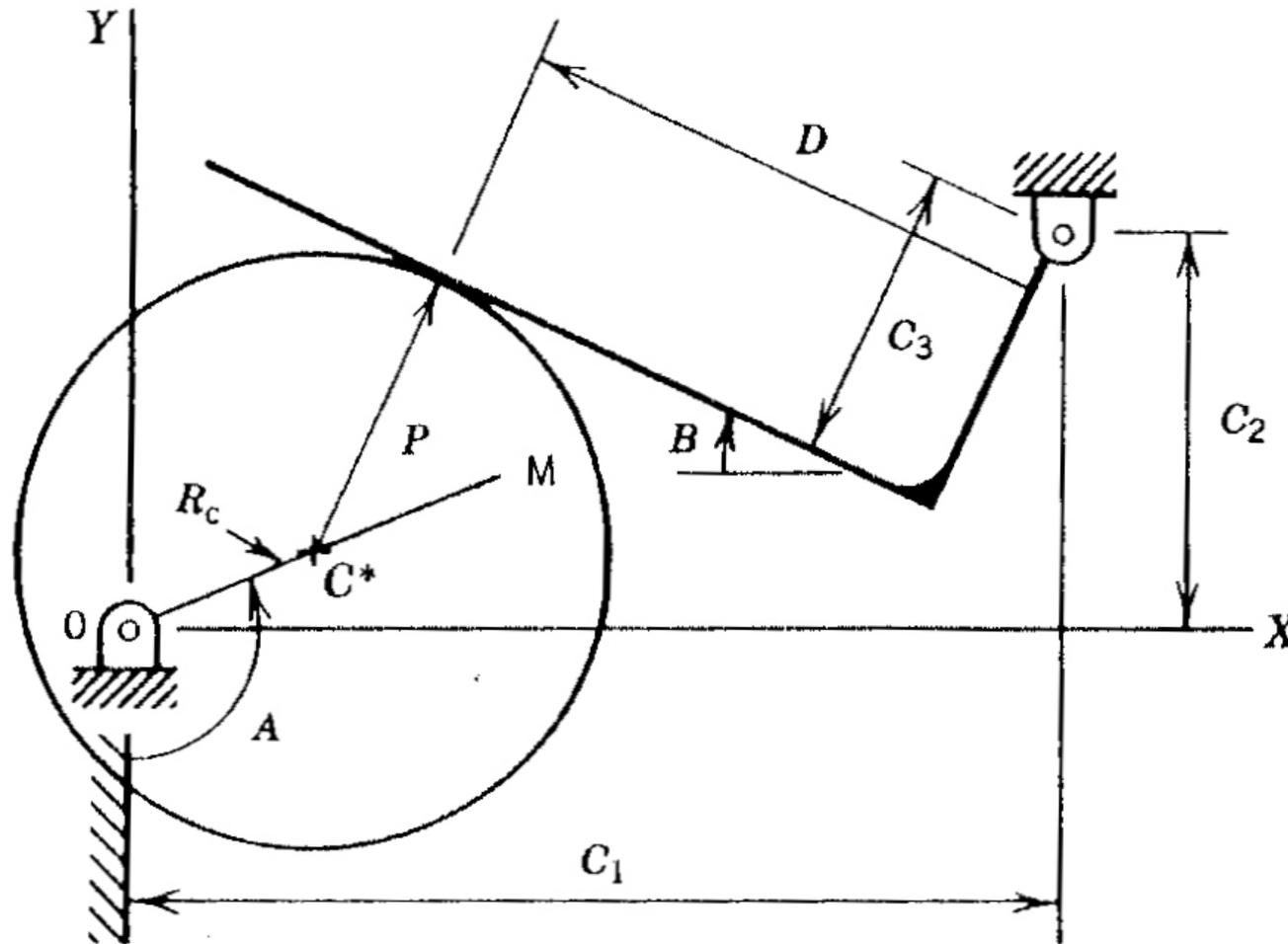


FIGURE 4.24 Full Circle Eccentric Cam with Oscillating Flat-faced Follower

Seguidor oscilante de face plana

Posição do seguidor (obtida partindo das equações cinemáticas de posição)

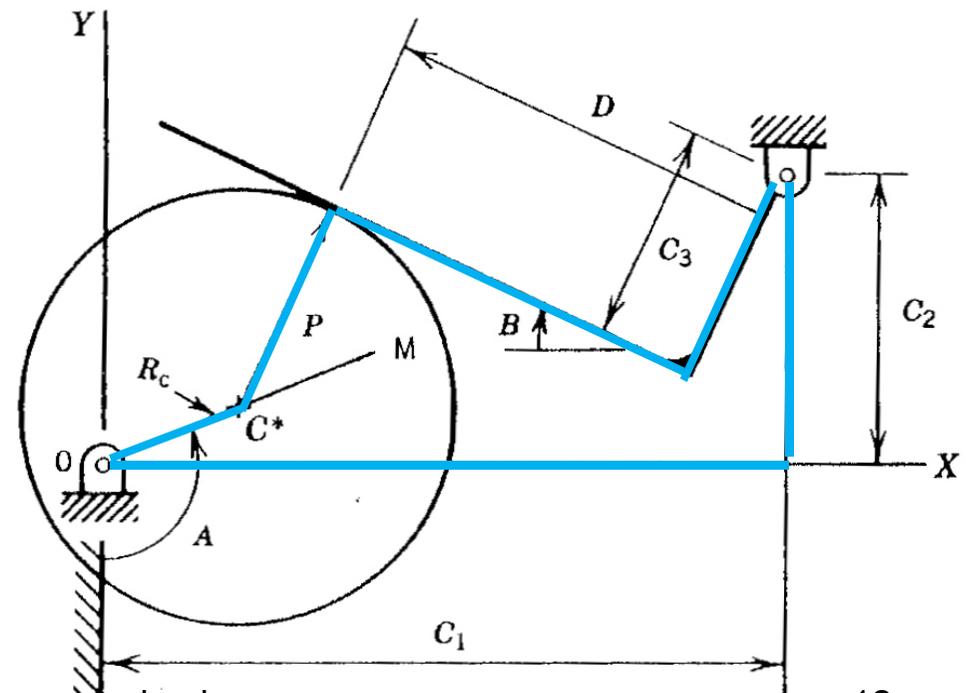
$$E(A) = \arctan_2 \left(\frac{C_1 - R_C \cdot \sin(A)}{C_2 + R_C \cdot \cos(A)} \right)$$

$$W(A) = \sqrt{(C_1 - R_C \cdot \sin(A))^2 + (C_2 + R_C \cdot \cos(A))^2}$$

$$B(A) = -\arccos \left(\frac{P + C_3}{W(A)} \right) + E(A)$$

Posição do ponto de contato

$$D(A) = W(A) \cdot \sin(E(A) - B(A))$$



Análise de camês circulares

FIGURE 4.24 Full Circle Eccentric Cam with Oscillating Flat-faced Follower

Seguidor oscilante de face plana

Velocidade (derivada das equações cinemáticas em relação ao tempo)

$$f'(A) = R_C \cdot \sin(A + B)$$

$$\dot{B}(A) = f'(A) \cdot \dot{A}$$

Aceleração

$$f''(A) = R_C \cdot (1 + f'(A)) \cdot \cos(A + B)$$

$$\ddot{B}(A) = f'(A) \cdot \ddot{A} + f''(A) \cdot \dot{A}^2$$

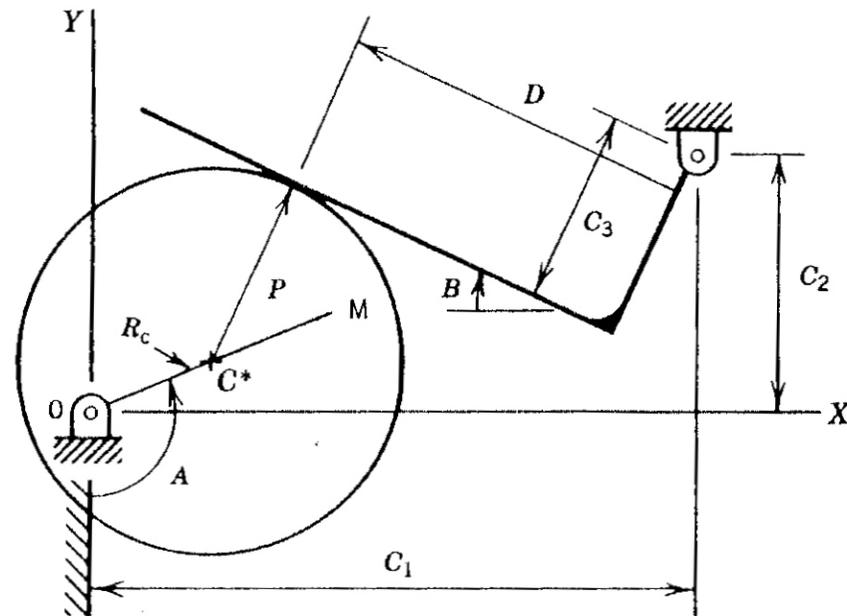


FIGURE 4.24 Full Circle Eccentric Cam with Oscillating Flat-faced Follower

Seguidor oscilante com rolete

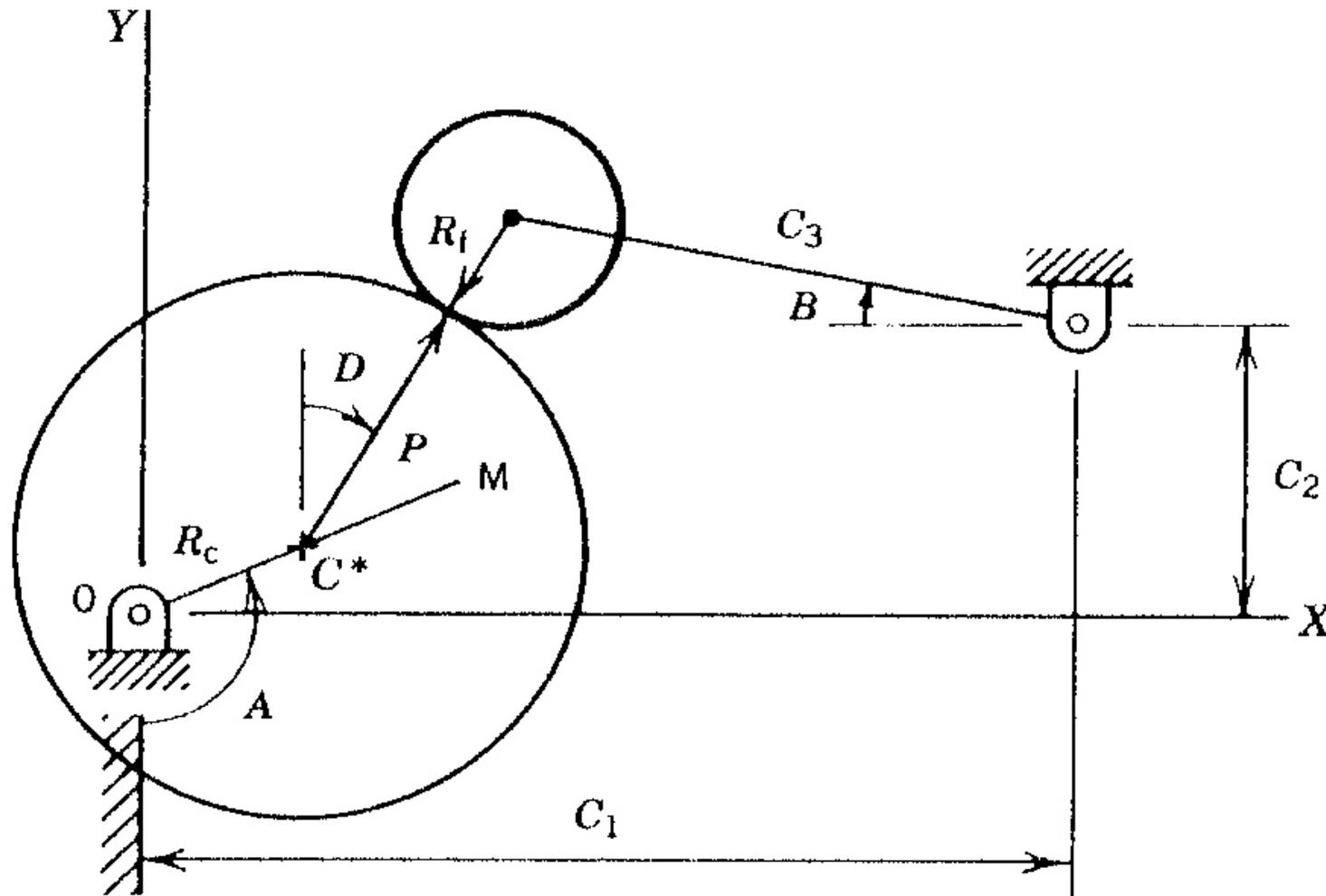
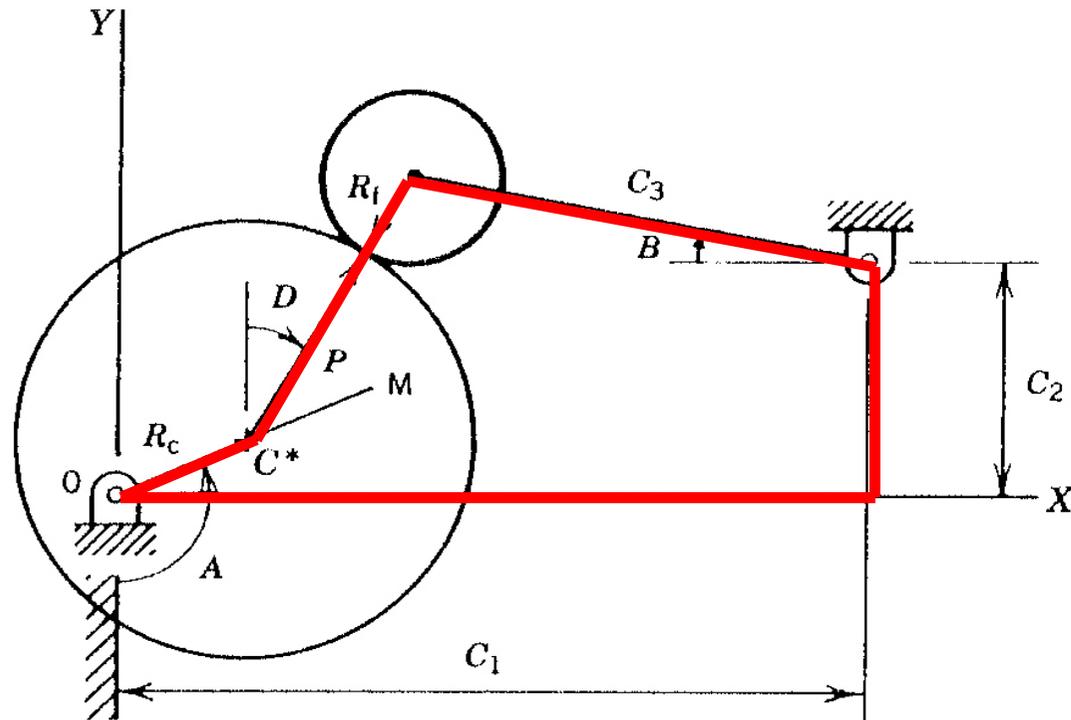


FIGURE 4.25 Full Circle Eccentric Cam with Pivoted, Roller Follower

Seguidor oscilante com rolete



Posição

FIGURE 4.25 Full Circle Eccentric Cam with Pivoted, Roller Follower

$$R_c \cdot \sin(A) + (P + R_f) \cdot \sin(D) + C_3 \cdot \cos(B) - C_1 = 0$$

$$-R_c \cdot \cos(A) + (P + R_f) \cdot \cos(D) - C_3 \cdot \sin(B) - C_2 = 0$$

Seguidor oscilante com rolete

Velocidade

$$f'(A) = \frac{R_C \cdot \sin(A + D)}{C_1 \cdot \cos(B - D)}$$

$$d'(A) = \frac{-R_C \cdot \cos(A + B)}{(P + R_f) \cdot \cos(B - D)}$$

$$\dot{B}(A) = f'(A) \cdot \dot{A}$$

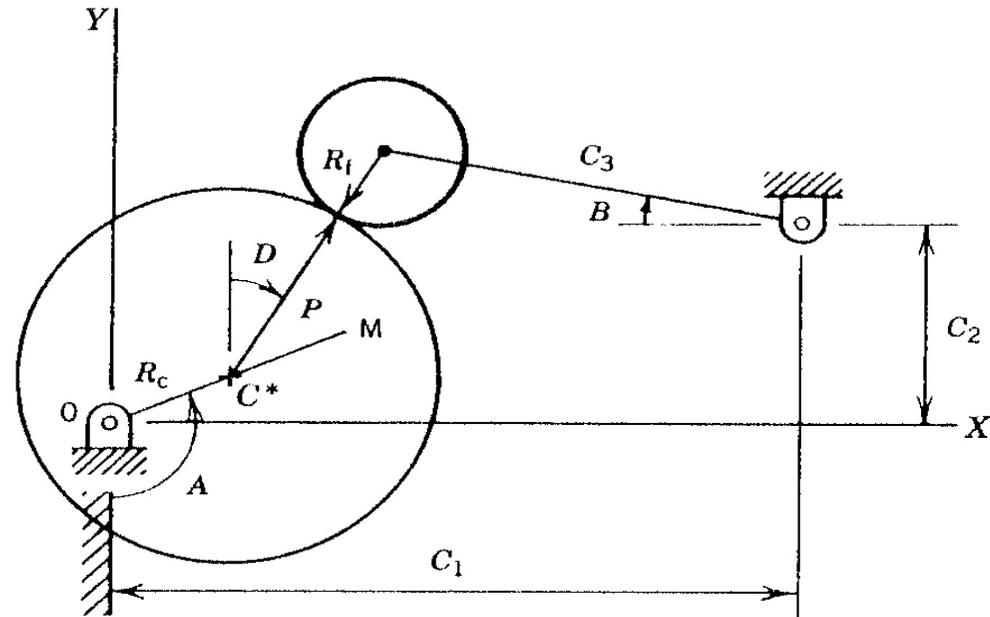


FIGURE 4.25 Full Circle Eccentric Cam with Pivoted, Roller Follower

Aceleração

$$f''(A) = \frac{R_C}{C_3} \cdot \frac{(\cos(B - D) \cdot \cos(A + D) \cdot (1 - d') + \sin(B - D) \cdot \sin(A + D) \cdot (f' - d'))}{\cos^2(B - D)}$$

$$\ddot{B}(A) = f''(A) \cdot \dot{A}^2 + f'(A) \cdot \ddot{A}$$

Exemplos

Ver arquivos Matlab e Design View

Referência

Doughty, S.. MECHANICS OF MACHINES. New York:
John Wiley, 1988.

Capítulo 4