

a) Fuerzas: $F_x = F - f$

$$F_y = \mu N - Mg$$

$$M\ddot{y} = 0 = N - Mg \Rightarrow N = Mg \quad (1)$$

$$M\ddot{x} = F - f \quad (2)$$

Torque: $\tau = Fb - fR = \alpha I \quad (3)$

$$\alpha = \dot{\omega} = \frac{a}{R} = \frac{\ddot{x}}{R} \quad (4)$$

Reemplazando (4) en (3) $\Rightarrow Fb - fR = \frac{\ddot{x}}{R} \cdot \frac{MR^2}{2} = \frac{\ddot{x}MR}{2} \quad (5)$ + 1

de (2) $f = F - M\ddot{x}$

Reemplazando en (5) $\Rightarrow Fb - (F - M\ddot{x})R = \frac{\ddot{x}MR}{2}$

$$Fb - FR + MR\ddot{x} = \frac{\ddot{x}MR}{2}$$

$$\frac{MR\ddot{x}}{2} = F(R - b)$$

$$\ddot{x} = \frac{2F(R - b)}{MR} \quad (6) \quad \text{+ 1}$$

Reemplazando (6) en (2)

$$\frac{M \cdot 2F(R-b)}{MR} = F - f$$

$$2F - \frac{2Fb}{R} - F = -f$$

$$f = \frac{F(2b-R)}{R}$$

Condición de rodar sin resvalar: $f \leq \mu N$

$$\Rightarrow f = \frac{F(2b-R)}{R} \leq \mu N = \mu Mg \text{ de (1)}$$

$$F \leq \frac{\mu MgR}{2b-R}$$

$$\Rightarrow F_{\max} = \frac{\mu MgR}{2b-R} \quad +2$$

b) Ahora

$$F_x = F \cos(\theta) - f = 0 \quad \xrightarrow{\text{reposo}} \Rightarrow f = F \cos(\theta)$$

$$\tau = F \cos(\theta) b - F \cos(\theta) R = \dot{\omega} I = 0$$

$\hookrightarrow \dot{\omega} = 0 (\text{reposo})$

$$F \cos(\theta) (b - R) = 0 \Rightarrow \cos(\theta) = 0$$

$\theta = 90^\circ$

o simplemente $f = 0$ porque solo nos interesa el torque de F , y al ser cero no se requiere un roce que lo contrarreste.

$$\Rightarrow \tau = F \cos(\theta) \cdot b = 0 \Rightarrow \cos(\theta) = 0$$

$$\theta = 90^\circ$$

+ 2