

A2)

$$\textcircled{1} \quad mg \sin \phi + c \left[\frac{I}{(\delta - x)} \right] - k(x - \delta) - b\dot{x} = \frac{7m\ddot{x}}{5}$$

$$\textcircled{2} \quad \dot{I} = \frac{V - IR}{L_0 + L_1 e^{-\kappa(\delta - x)}}$$

$$\begin{bmatrix} z_1 = x \\ z_2 = \dot{z}_1 \\ z_3 = I \end{bmatrix} \quad \frac{5m}{7} \left(mg \sin \phi + c \left[\frac{z_3}{(\delta - z_1)} \right] - k(z_1 - \delta) - bz_2 \right) = \dot{z}_2$$

$$\dot{z}_3 = \frac{V - z_3 R}{L_0 + L_1 e^{-\kappa(\delta - z_1)}}$$

$$z = \begin{bmatrix} z_1 \\ z_2 \\ z_3 \end{bmatrix}$$

$$z = \begin{bmatrix} x \\ \dot{x} \\ I \end{bmatrix} \quad \uparrow \parallel$$

$$\dot{z} = \begin{bmatrix} z_2 \\ \frac{5m}{7} \left(mg \sin \phi + c \left[\frac{z_3}{(\delta - z_1)} \right] - k(z_1 - \delta) - bz_2 \right) \\ \frac{V - z_3 R}{L_0 + L_1 e^{-\kappa(\delta - z_1)}} \end{bmatrix}$$

$$f(z, v)$$