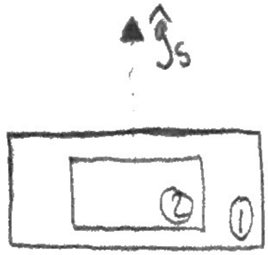

$$H_{sc} = I_1\omega_1 + J_s(\omega_1 + \Omega)$$

$$\dot{H}_{sc} = I_1\dot{\omega}_1 + J_s(\dot{\omega}_1 + \dot{\Omega}) = 0$$

$$(I_1 + J_s)\dot{\omega}_1 + J_s\dot{\Omega} = 0 \qquad (1)$$

$$H_W = J_s(\omega_1 + \Omega)$$

$$\dot{H}_W = J_s(\dot{\omega}_1 + \dot{\Omega}) = u_s$$

$$J_s\dot{\omega}_1 + J_s\dot{\Omega} = u_s \qquad (2)$$

State space:

$$\begin{bmatrix} (I_1 + J_s) & J_s \\ J_s & J_s \end{bmatrix}\begin{bmatrix} \dot{\omega}_1 \\ \dot{\Omega} \end{bmatrix} = \begin{bmatrix} 0 \\ u_s \end{bmatrix}$$

Used Mathematica:

$$\begin{bmatrix} \dot{\omega}_1 \\ \dot{\Omega} \end{bmatrix} = \begin{bmatrix} -\dfrac{u_s}{I_1} \\ \dfrac{(I_1 + J_s)u_s}{I_1 J_s} \end{bmatrix}$$

$$\int d(\omega_1) = \int -\frac{u_s}{I_1}\,dt$$

$$\boxed{\omega_1(t) = -\frac{u_s}{I_1}t + \omega_0}$$

$$\int d\dot{\theta} = \int\left(-\frac{u_s}{I_1}t + \omega_0\right)dt$$

$$\boxed{\theta(t) = -\frac{1}{2}\frac{u_s}{I_1}t^2 + \omega_0 t + \theta_0}$$

$$\boxed{\Omega(t) = \frac{(I_1 + J_s)u_s}{I_1 J_s}t + \Omega_0}$$