$N^{\frac{2}{3}}$, S_{cm} s

$\ddot{x}_{c_1} = -\omega^2 x_{c_1}$

$x_a = x(t_a)$

$x_{c_1} = A\sin(\omega t) + B\cos(\omega t)$

$x_b = x(t_b)$

$t \to t - t_a \qquad t_a \to 0$

$t_b \to T$

$x_{c_1}\Big|_{t=t_a} = B\cos\omega t_a = x_a \Rightarrow B = x_a$

$x_{c_1}\Big|_{t=t_b} = A\sin\omega t_b + x_a\cos(\omega t_b) = x_b \Rightarrow A = \dfrac{x_b - x_a \cos\omega T}{\sin\omega T}$

$x_{c_1} = A\sin\omega t + x_a\cos\omega t$

$\dot{x}_{c_1} = \omega\left[A\cos\omega t - x_a\sin\omega t\right]$

$x_{c_1}^2 = A^2\sin^2\omega t + x_a^2\cos^2\omega t + 2A x_a\sin\omega t\cos\omega t$

$\dot{x}_{c_1}^2 = \omega^2\left[A^2\cos^2\omega t + x_a^2\sin^2\omega t - 2x_a A\sin\omega t\cos\omega t\right]$

$S_{c_1} = \dfrac{m\omega^2}{2}\displaystyle\int_0^T\left(\dot{x}^2/\omega^2 - x^2\right)dt = \dfrac{m\omega^2}{2}\left[\left(A^2 - x_a^2\right)\dfrac{\sin\omega T\cos\omega T}{\omega}\right.$

$\left.- 2Ax_a\dfrac{\sin^2\omega T}{\omega}\right] = \dfrac{m\omega^2}{2\sin\omega T}\left[\left(A^2 - x_a^2\right)\sin^2\omega T\cos\omega T\right.$

$\left.- 2Ax_a\sin^3\omega T\right] = \dfrac{m\omega}{2\sin\omega T}\left[\left(x_b^2 + x_a^2\cos^2\omega T - 2x_a x_b\cos\omega T\right) - x_a\sin^2\omega T\right)\cos\omega T$

$\left.- 2\{x_a x_b - x_a^2\cos\omega T\}\sin^2\omega T\right] = \dfrac{m\omega}{2\sin\omega T}\left[\left(x_a^2 + x_b^2\right)\cos\omega T - 2x_a x_b\right]$