**Exam Practice Problem 3**

In PHYS 7A you learned that a damped simple harmonic oscillator (mass $m$, spring constant $k$, frequency $\omega = \sqrt{k/m}$) experiences a linear friction force of the form $F = -b\dot{x}$ where $\dot{x}$ is the velocity. The transient response of the oscillator shows damped oscillations with damping time constant $\tau = 2m/b$. Consider such an oscillator where the mass $m$ consists of a square loop of wire (side length $L$) that oscillates with one end in a uniform magnetic field $B$ as shown in the figure. The wire has cross sectional area $a$ and resistivity $\rho$. Compute $b$ in terms of $a$, $\rho$, $L$, $\tau$, and $B$. (Neglect the self inductance of the loop.)