Close $S$ at $t = 0$. Loop equation are

for $BB'C'C'B$ loop: $R_2I'' = L \frac{dI}{dt}$;

for $ABB'C'C'DA$: $\mathcal{E} - R_1(I'' + I) - L \frac{dI}{dt} = 0$.

Time dependence of $I$ has the form $I = \frac{\mathcal{E}}{R_{eq}} \left[ 1 - \exp\left(-\frac{t}{\tau_{eq}}\right) \right]$

Determine the equivalent resistance $R_{eq}$ for this circuit after a long time period; i.e., $t \gg 1$.

A) $R_{eq} = R_1$.  

B) $R_{eq} = R_2$.

C) $R_{eq} = R_1 + R_2$.  

D) $R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$. 


From the given expression for $I$, at large $t$, $I = \frac{\mathcal{E}}{R_{eq}}$. On the other hand, by inspection at large $t$, the current should be steady with no potential drop across $L$. So the asymptotic current should be $I = \frac{\mathcal{E}}{R_1}$. Thus $R_{eq} = R_1$.

Answer A.