In a normal mode \( \frac{\partial I_1}{\partial t} = -\omega^2 I_1 \). Put this fact into the equations to get the set

\[
-\frac{C}{L} \frac{\partial I_1}{\partial t} + \frac{\partial^2 I_1}{\partial t^2} - I_2 + I_3 = 0
\]

(since capacitor has no net charge).

But

\[
\frac{\partial I_1}{\partial t} = \frac{\partial^2 I_1}{\partial t^2} + L \left( I_1'' + I_3'' \right) = 0
\]

Writing loop equation for loop 1

\[
\frac{1}{L} (q_1 - q_2) - L (I_1'' + I_2'') + L (I_1'' + I_3'') = 0
\]

\[
\Rightarrow I_1'' + I_2'' = 0
\]

\[
\Rightarrow I_2'' = I_1''
\]