$$
\begin{aligned}
i_{1\sim}(t) &= \left(\frac{\partial I_1}{\partial V_1}\right)_{V_2} v_{1\sim}(t) + \left(\frac{\partial I_1}{\partial V_2}\right)_{V_1} v_{2\sim}(t) \\
&= y_{11} \cdot v_{1\sim}(t) + y_{12} \cdot v_{2\sim}(t) \\
i_{2\sim}(t) &= \left(\frac{\partial I_2}{\partial V_1}\right)_{V_2} v_{1\sim}(t) + \left(\frac{\partial I_2}{\partial V_2}\right)_{V_1} v_{2\sim}(t) \\
&= y_{21} \cdot v_{1\sim}(t) + y_{22} \cdot v_{2\sim}(t) \ .
\end{aligned}
$$