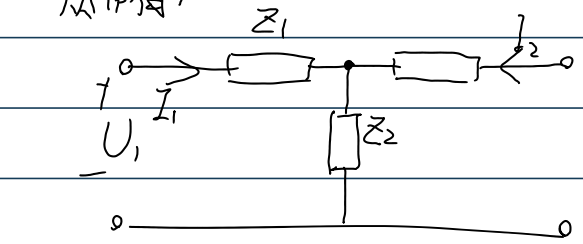
二端口等效电路关系

Tuesday, December 5, 2023 8:22 AM

① Z参数等效电路：

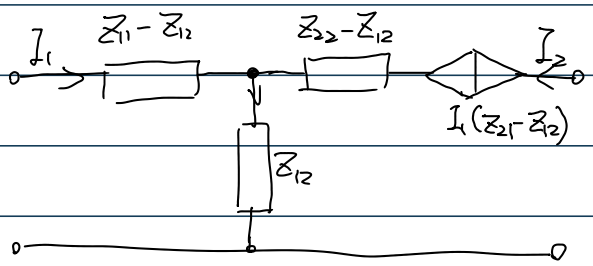
由 $\begin{cases} U_1 = Z_{11}I_1 + Z_{12}I_2 \\ U_2 = Z_{21}I_1 + Z_{22}I_2 \end{cases}$

从而有：



$U_1 = Z_{12}(I_1+I_2) + (Z_{11}-Z_{12})I_1$

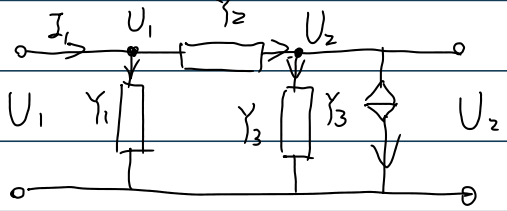
此时，U_2无法等效，故加入受控源：



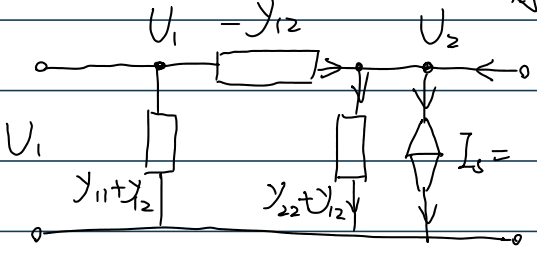
$U_2 = (I_1+I_2)Z_{12} + I_2(Z_{22}-Z_{12}) + I_1(Z_{21}-Z_{12})$

等效电路如左图

② Y参数：同理有：在右侧加受控电流源：



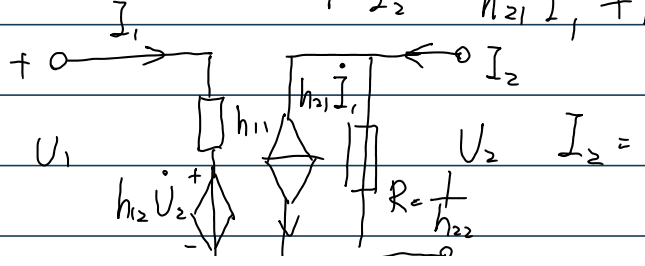
有：$\begin{bmatrix} I_1 = y_{11}U_1 + y_{12}U_2 \\ I_2 = y_{21}U_1 + y_{22}U_2 \end{bmatrix}$

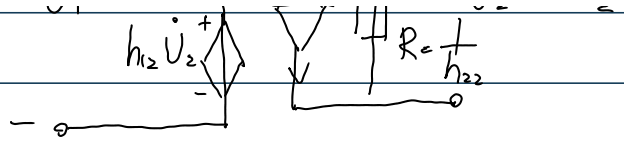


有：$\begin{cases} I_1 = (y_{11}+y_{12})U_1 - y_{12}(U_1-U_2) \\ I_2 = (y_{22}+y_{12})U_2 + y_{12}(U_1-U_2) + U_1(y_{21}-y_{12}) \end{cases}$

得左图等效电路

③ h参数：$\begin{cases} \dot{U}_1 = h_{11}\dot{I}_1 + h_{12}\dot{U}_2 \\ \dot{I}_2 = h_{21}\dot{I}_1 + h_{22}\dot{U}_2 \end{cases}$




$h_{12}\dot{U}_2$
+
−
$R=\frac{1}{h_{22}}$